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THE LITOPTERNA.

BY E. D. COPE.

THERE has been known for many years a mammal of the Pampean formation of Buenos Ayres called by Professor Owen Macrauchenia.[1] It is distinguished by many peculiarities, but at the time of its first description its characters were chiefly known from the skull and cervical vertebræ. The former resembles very much that of a horse, but has the strange peculiarity of having the external nostrils posterior to their usual position in land mammals,—that is, between the eyes, where it is placed in the sea-cows or manatees. The teeth were generally found much worn, but their general appearance was like those of primitive three-toed horses; but the canines were small and like the premolars. The cervical vertebræ, on the other hand, displayed characters like those found in the camels, especially in the absence of an especial canal for the vertebral artery, which presumably ran in the canal of the spinal cord. The position of this animal was absolutely uncertain, on account of the absence of specimens of the feet; but Professor Owen was inclined to place it in the Perissodactyla, and other authorities have followed him (Plate XVII.).

Professor Burmeister, of Buenos Ayres, later obtained still better specimens, which included parts of the hind feet. He found that it had three toes on both feet, and he published a restoration of it. He

[1] Zool. of the Voyage of the "Beagle," Fossil Mammalia, p. 35, Pl. V. and XV., 1389.

represented it as a long-legged and long-necked mammal, furnished with the short proboscis of a tapir.[2] Within a few years good specimens of the fore feet were received in Paris, and Messrs. Scott and Osborn have given us a figure of that member, which, with what was known before of the hind foot, enables us to place the genus finally in the system. The carpus and tarsus are both taxeopodous, or with the bones of the two rows in continuous lines and not alternating.[3] So this genus is a taxeopod, and cannot enter the Perissodactyla, which is diplarthrous.

The lamented French paleontologist, Bravard, who perished in the earthquake at Mendoza, thought he had discovered in Argentina species of the European genera Palæotherium and Anoplotherium, which were found by Cuvier in the Eocene deposits near the city of Paris. The discovery of these genera in this region was unlooked for, and its announcement excited much curiosity, if not credence.

In 1873 Prof. W. H. Flower described and figured in the Philosophical Transactions of London (p. 173) the dentition of a new mammal, under the name of *Homalodontotherium cunninghamii.* He regarded it as allied to Rhinoceros on the one hand and Macrauchenia on the other (Fig. 4).

Some years after this Burmeister announced the finding by Moreno of the skull of a large mammal in the Eocene beds of Patagonia, of remarkable character. It was represented as having large and formidable canine teeth and a very short series of molars, but of its affinities no definite idea was expressed. It was named *Astrapotherium patagonicum.*

In the great work on the "Extinct Mammalia of Argentina," recently issued by Ameghino, which is reviewed in the present number of the NATURALIST, the characters of these forms are much more completely described than previously, and the relations of several of them have been clearly pointed out. Information is furnished which enables us to estimate the position of them with certainty. In the year in which this volume was issued the present writer published in the NATURALIST a "Syn-

[2] Annal. del Mus. Pub. de Buenos Ayres, T. I., p. 32, Pl. I.–IV.; p. 252, Pl. XIII.

[3] Transactions of the Amer. Philos. Soc., 1889, Vol. XVI., p. 540.

opsis of the Families of the Vertebrata" (1889). Here the results of my study of the preliminary papers of Ameghino and Burmeister were embodied in the following systematic form. The Macraucheniidæ were placed in the suborder Toxodontia (p. 28). Ameghino having shown that the supposed Palæotherium and Anoplotherium of Bravard were allied to this family, and should be referred to the genera Proterotherium and Oxyodontotherium, a family, Proterotheriidæ, was proposed for the former, and it was also placed in the Toxodontia. The Toxodontia were placed in the Taxeopoda. Ameghino's researches having shown that the fore-foot structure of the Toxodontidæ and Mesotheriidæ is that of the Amblypoda, while the posterior foot only has the taxeopod structure, it became evident that the Toxodontia must be regarded as a distinct order between the Taxeopoda and the Amblypoda. The Proterotheriidæ and Macraucheniidæ having the taxeopod structure of both extremities, must remain where I placed them. M. Ameghino, disregarding the question of taxeopody and diplarthry, places these families under the Perissodactyla, and proposes to regard them as a suborder, with the name of the Litopterna. This name will be retained, and will apply in my system to a suborder of the Taxeopoda.

The structure of the feet of the Astrapotheriidæ remains unknown. Their location will depend entirely on the solution of this question. M. Ameghino places them in the Amblypoda. This position is rendered extremely improbable by the structure of the true molar teeth. Those of Astrapotherium resemble those of the Toxodontia, but still more those of Macrauchenia. Homalodontotherium resembles Rhinoceros. Until the question is positively settled by the discovery of the feet, I place them in the Litopterna as their most probable position, following Ameghino, so far as regards Homalodontotherium, which he places here.

The suborder Litopterna is nearly related to the Condylarthra, and it is probable that future discovery will obliterate the differences which we find to characterize the known types. The prime characters in which the Litopterna differ from the Condylarthra are the absence of epitrochlear foramen of the humerus, and the

ginglymoid articulation of the astragalus with the navicular in one, the anteroposterior, plane. In the Condylarthra this articulation is ball and socket, or nearly universal, as in the Unguiculates generally. The articulation in the Litopterna is of ungulate character, and has the same functional value in the fully developed forms, such as Epitherium, as in the Artiodactyla. In the known forms the fibula articulates with the calcaneum, another point in which they differ from the Condylarthra. A peculiar character, said by Ameghino to characterize this suborder, is the presence of four roots of some of the inferior premolars and molars. This authority also states that they do not possess a clavicle.

The three families differ as follows.

Superior molars essentially tritubercular, the two external cusps modified into Vs; inferior molars with Vs; *Proterotheriidæ.*

Superior molars with straight external wall and cross-crests, no Vs; *Astrapotheriidæ.*

Superior molars with subequal external Vs and cross-crests; inferior molars with Vs; *Macraucheniidæ.*

The dentition of the Proterotheriidæ could be easily derived from that of the Periptychidæ of the Condylarthra by the modes of complication usual in other Ungulata. On the other hand that of the Macraucheniidæ could have been derived from that of the Meniscotheriidæ. The dental type of the Astrapotheriidæ could have been derived from that of Protogonia by a process similar to that by which the Rhinocerotine line arose from a primitive quadritubercular diplarthrous form. The parallel presented by the succession of the Litopterna in time as compared with that of Diplarthra is most remarkable. The resemblances in the dentition are such that the early students of the paleontology of Argentina referred members of the Proterotheriidæ and Macraucheniidæ to the Perissodactyla and Artiodactyla, and later authors have referred one of the Astrapotheriidæ to the Rhinocerotidæ. In the last case the resemblance may be traced in all parts of the molar teeth, even including the plication of the anterior part of the external wall of the crown. The entire suborder is a

remarkable illustration of the identity of results produced by identical mechanical causes. The parallel is further increased by the diminution in the number of the digits, in the cases when the structure is known, in the course of geologic time.

The families range from the Lower Eocene to Plistocene time. They have not been found hitherto outside of South America. They thus continued much longer than the Condylarthra, and must be regarded as a derivative of that suborder, which found in South America conditions favorable for continuance which were wanting in North America.

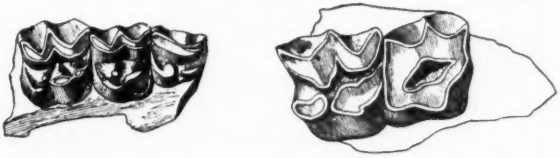

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FIG. 1.—*Proterotherium ? cavum* Amegh. ; last three premolars, grinding face ; natural size. FIG. 2.—*Epitherium laternarium* Amegh. ; true molars, from below ; natural size. Both from Ameghino.

I now consider their characters in greater detail.

In the PROTEROTHERIIDÆ we have a type more closely connected with the Periptychidæ of the Condylarthra than any later form. The superior molars are tritubercular, the protocone with well-developed accessory tubercles anteriorly and posteriorly, as in Periptychus. The external cusps of these teeth are modified into Vs, however, as in Meniscotherium. The three internal cusps become confluent on wear (Figs. 1, 2).

The genera distinguishable in the material furnished by M. Ameghino are as follows:

Digits? Symphysis not coössified; no intermediate tubercles of the superior molars; *Proterotherium* Amegh.

Like the last, but intermediate tubercles present; *Anisolophus* Burm.

Symphysis mandibuli coössified; *Thoatherium* Amegh.

No intermediate tubercles; ? symphysis; three digits, the lateral rudimental; *Epitherium* Amegh.

It is not yet possible to determine the number of digits present in the greater number of the genera of this family. It is, however, extremely probable that we have four or five in the Eocene genera Anisolophus and Thoatherium. If so, we have a successional reduction in later periods, similar to that which has been shown to have occurred in the horse line. In Epitherium Amegh. we reach a stage corresponding to that of Hippotherium, the lateral digits being reduced to the condition of dew-claws, according to Ameghino (Fig. 3). Proterotherium and Anisolophus are the only genera in which the dentition is well known, and our knowledge is confined to the molars. The premolars nearly resemble the true molars in both jaws.

Fig. 3.—*Epitherium laternarium* Amegh.; right posterior foot; two-fifths natural size. From Ameghino.

Two species certainly belong to Proterotherium, and they are from the "inferior Oligocene" of Patagonia. Three other species from the Oligocene and Eocene of the same region, described under distinct generic names by Ameghino, have not been yet clearly distinguished from Proterotherium. Two species are referred to Anisolophus, which with the single one of Thoatherium are from the Eocene. But one species of Epitherium (*E. laternarium* Amegh.) is yet known. This is a most interesting animal, and took the place in the Miocene fauna of Argentina (according to Ameghino) of the three-toed horses in the corresponding age in the Northern Hemisphere. It was about the size of a small guanaco, and was digitigrade, like the higher Diplarthra.

In the MACRAUCHENIIDÆ we have a line of modification different from that of either of the other two families, resembling in some respects both of them. Thus the superior molars are constructed on the one type in the modification of the external

cusps into more or less distinct Vs of equal proportions, while the internal part of the crown is modified from transverse crests, such as are seen in the Toxodontia. The genera are as follows:

I. Canines one-rooted.

? Canines; incisors small and separated by diastemata;	*Diatomicodon* Amegh.
Inferior molars with simple Vs;	*Scalabrintherium* Amegh.
Vs of inferior molars with an external transverse branch;	*Oxyodontotherium* Amegh.

II. Canines above two-rooted.

? Canines; external nares advancing to between premaxillaries;	*Mesorhinus* Amegh.
External nares bounded by maxillaries in front;	*Macrauchenia* Ow.

But little is known of these genera, excepting Macrauchenia. In this genus there are three subequal toes, both anteriorly and posteriorly, and progression was digitigrade. The nostrils were remarkable for their posterior position, being partly above the orbits. The latter are closed behind. The last premolar teeth only in both jaws are like the molars, and there is a short diastema in front of the small canine. Incisors like those of a horse, without the cups. Dental formula: I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pm. $\frac{3}{3}$; M. $\frac{3}{3}$. The molars, as is often the case in the Argentine forms, soon wear so as to obscure the structure, and an internal cingulum encloses the spaces between the cross-crests as fossæ. The absence of vertebrarterial canal from the cervical vertebræ in this genus is a repetition of what occurs in the Camelidæ. Four species of Macrauchenia are described (Plate XVII.).

Macrauchenia patachonica Owen was an animal of about the proportions of a mule. The posterior position of the external nostrils has suggested that the habits were aquatic, or that it possessed a short trunk like the tapir. It is a characteristic species of the Pliocene beds of Buenos Ayres. A smaller species, *M. boliviensis* Huxley, has been found in corresponding beds in Bolivia. *Scalabrintherium paranense* Brav. and *orthii* Amegh. are from Miocene beds of the Paraña. The same formation has produced the *Mesorhinus pyramidatus* Amegh., which

had the dimensions of the guanaco. No genus of the family has been yet reported from the Eocene.

The Astrapotheriidæ include the largest forms of the Litopterna, if they belong truly to this suborder. Three genera are certainly known, which differ as follows:

Dentition; I. $\frac{?}{3}$; C. $\frac{1}{1}$; Pm. $\frac{4}{4}$;
M. $\frac{3}{3}$; no diastema! *Homalodontotherium* Huxley.

Dentition; I. $\frac{3}{3}$; C. $\frac{1}{1}$; Pm. $\frac{2}{1}$;
M. $\frac{3}{3}$; a long diastema; *Astrapotherium* Burm.

Dentition; I. ?; C. ?; Pm. $\frac{1}{1}$;
M. $\frac{3}{3}$; a long diastema; *Listriotherium* Merc.

In Homalodontotherium the dental series is uninterrupted, and the canines are small and resemble simple premolars. The premolars differ somewhat from the molars, and the molar series

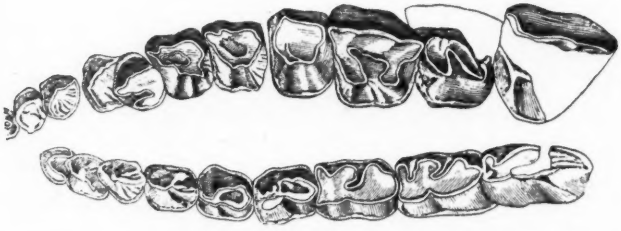
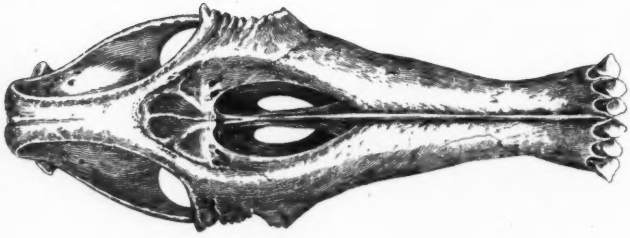


FIG. 4.—*Homaladontotherium cunninghamii* Flower; upper and lower dental series; about two-fifths natural size. From Flower.

generally has much the appearance of that of Cænopus among the rhinoceroses. In the inferior molars the resemblance is not so great, although not wanting (Fig. 4). Nothing is known of the typical and only species, *H. cunninghamii* Flower, but the dentition, and this indicates an animal of the size of an ox.

In Astrapotherium Burm. the dentition is much more specialized. The canines are large, and they are followed by a diastema. There are only two premolars above and one below. The superior premolars differ from the true molars more than is the case with Homalodontotherium, but they have the same character, —*i. e.*, an external wall, and a curved internal crest, the convexity

PLATE XVII.



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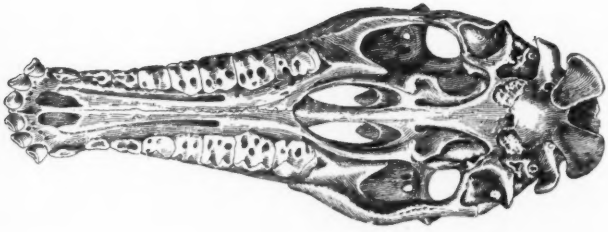

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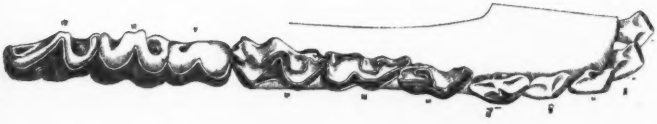

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Macrauchenia patachonica Owen.

inwards. They are much smaller than the true molars (Fig. 5). Five species are known. The *A. magnum* Owen, the largest mammal of the Eocene of South America, equals a rhinoceros in

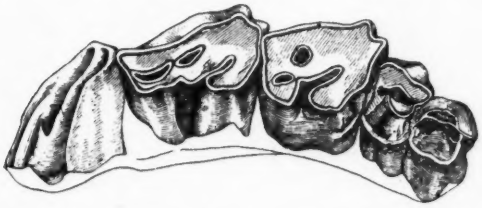

FIG. 5.—*Astrapotherium magnum* Owen; last five superior molars; about one-third natural size. From Ameghino.

dimensions. Its canine teeth, well developed in each jaw, rendered it a formidable animal.

All the species of the Astrapotheriidæ are from the Lower Eocene of Patagonia.

EXPLANATION OF PLATE XVII.

Macrauchenia patachonica Owen; from Burmeister; much reduced.

FIG. 1.—Skull from above.
FIG. 2.—Skull from below.
FIG. 3.—Superior dental series.
FIG. 4.—Inferior dental series.

THE HISTORY OF GARDEN VEGETABLES.

BY E. L. STURTEVANT.

(Continued from page 744, Vol. XXIV., 1890.)

STACHYS. *Stachys affinis* Vil.

THIS plant was introduced into cultivation by Messrs. Vilmorin-Andrieux et Cie, in 1886.[1] The roots are thick and fleshy, and are called useful for pickles, and may be used fried. According to Bretschneider,[2] the roots were eaten as a vegetable in China in the fourteenth and sixteenth centuries, and are described as a cultivated vegetable by Chinese writings of 1640 and 1742. It is used as a cultivated vegetable in Japan, and is called *choro-gi*, and, as Mr. Tamari tells me, it is esteemed.

SUGAR BEET. *Beta vulgaris* var.

These are selected forms from the common beet, and scarcely deserve a separate classification. Those figured by Vilmorin are all of the type of the half-long red, agree in being mostly underground, and in being very or quite scaly about the collar. The sugar beet has been developed through selection of the roots richest in sugar for seed-bearers. The sugar-beet industry was born in France in 1811, and in 1826 the product of the crop was 1,500 tons of sugar. The formation of the "sugar beet" could not, then, have preceded 1811; yet in 1824 five varieties, the *grosse rouge*, *petite rouge*, *rouge ronde*, *jaune*, and *blanche*, are noted,[3] and the French sugar or amber reached American gardens before 1828.[4] A richness of from sixteen to eighteen per cent. of sugar is now claimed for Vilmorin's new improved white sugar beet.[5]

[1] Vilmorin-Andrieux et Cie. Seed Cat., 1886, with figures.
[2] Bretschneider. Bot. Sin., 53, 59, 83, 85.
[3] L'Hort. Fran., 1824.
[4] Fessenden. New Am. Gard., 1828, 40.
[5] Vilmorin. Les Pl. Pot., 1883, 51.
[6] Burr. Field and Gard. Veg., 399.

The names assigned by Vilmorin to the *sugar beet* are: France, *betteraves a sucre;* Germany, *zucker-rube;* Flanders and Holland, *suiker-wortel;* Spain, *remolacha de azucar, betabel de azucar;* Portugal, *betarava branca d'assucar.*

The discovery of sugar in the beet is credited to Margraff in 1747, announced in a memoir read before the Berlin Academy of Sciences.

SWEET CICELY. *Myrrhis odorata* Scop.

This aromatic herb can scarcely be considered as an inmate of American gardens, although recorded by Burr[6] in 1863. It has also fallen into disuse in Europe, although yet retained by Vilmorin[7] among garden vegetables. In 1597 Gerarde[8] says the leaves are "exceeding good, holsom, and pleasant among other sallade herbes, giving the taste of anise unto the rest." In 1778 Mawe[9] records that it is used rarely in England. Pliny[10] seems to refer to its use in ancient Rome, under the name *anthriscus.* It finds notice in most of the early botanies.

Sweet cicely or *sweet-scented chervil* or *sweet fern* is called in France, *cerfeuil musque, cerfeuil d'Espagne, cerfeuil anise, cicutaire odorante, fougere musquee, myrrhide odorante, persil d'ane de Lobel;* in Germany, *grosser spanischer wohlriechender kerbel;* in Flanders, *spaansche kervel;* in Denmark, *spansk kjorvel;* in Italy, *finocchiella*[7] or *mirride.*[11]

SWEET MARJORAM. *Origanum* sp.

But two species are enumerated by Vilmorin for European culture, but several other species were formerly grown. The leaves of all are used for seasoning.

Origanum vulgare L.

This aromatic herb, a native of Europe, has become naturalized sparingly in the Atlantic states, and is quite variable, affording a dwarf variety to culture. It is supposed to be the *Cunila*

[7] Vilmorin. Les Pl. Pot., 1883. 79.
[8] Gerarde. Herb., 1597, 883.
[9] Mawe. Gard., 1778.
[10] Pliny. Lib. XXII., c. 38.
[11] Pickering. Ch. Hist., 488.

bubula of Pliny,[12] and the *Origanum* of Albertus Magnus[13] in the thirteenth century. It is not, however, indicated as cultivated. It is called "English wilde marjerome" by Gerarde[14] in 1597, and "wild marjoram" by Ray[15] in 1686, who describes also the dwarf variety. It is mentioned as cultivated by Mawe[16] in 1778, but not by Bryant[17] in 1783, although a hundred years earlier Meager[18] gives the English name of "pot or wild marjoram" to one of the cultivated varieties, and includes also the "pide," which is probably the variety with variegated foliage mentioned by Burr,[19] who enumerates this species among American garden plants. Its culture is also mentioned by Worlidge in 1683, who enumerates the partly colored and the white varieties.

Common marjoram, pot marjoram, or *perennial marjoram* is called in France, *marjolaine vivace;* in Germany, *winter-marjoram;* in Flanders, *orego;* in Denmark, *merian;*[20] in France also, *origan;* in Germany, *dosten;* in Italy, *regamo* or *origano;* in Greece, *rigani* or *riganon;*[21] in Telinga, *mridu-maruvamu.*[22]

Origanum majorana L.

This is the species usually present in the herb-garden. It is supposed to be the *amaracus* of Pliny,[23] who speaks of it as cultivated. It is also the *marjorana* of Albertus Magnus[24] in the thirteenth century, and is mentioned as cultivated in the early botanies. Its modern culture is quite extended, and at Bombay it is considered sacred to Siva and Vishnu.[25] It is said to have

[12] Pliny. Lib. XX., c. 61.
[13] Albertus Magnus. De Veg., Jessen Ed., 544.
[14] Gerarde. Herb., 1597, 541.
[15] Ray. Hist., 1686, 539.
[16] Mawe. Gard., 1778.
[17] Bryant. Fl. Diet, 1783.
[18] Meager. Eng. Gard., 1683, 86.
[19] Burr. Field and Gard. Veg., 1863, 427.
[20] Vilmorin. Les Pl. Pot., 328.
[21] Pickering. Ch. Hist., 261.
[22] Birdwood. Veg. Prod. of Bomb., 65, 242.
[23] Pliny. Lib. XXI., c. 35.
[24] Albertus Magnus. L. c., 537.
[25] Birdwood. L. c., 368, 242.

reached Britain in 1573,[26] and was a well-known inmate in American gardens in 1806.[27]

Sweet marjoram, knotted marjoram, or *annual marjoram* is called in France, *marjolaine a coquille;* in Germany, *majoran, franzosischer majoran;* in Flanders and Holland, *marjolijn;* in Italy, *maggiorana;* in Spain, *mejorana, almoraduj;* in Portugal, *manjerona;*[28] in Norway, *merian;*[29] in Greece, *masouran, mantziourana;* in Egypt and Yemen, *mardakusj;* in Hindustani, *marzanjosh, marwa, nazbo;*[30] in Arabic, *mirzunjoosh, marda-kusch;* in the Deccan, *murwa;* in Tamil, *marroo;*[25] in the Mauritius, *marjolaine.*[31]

Origanum onites L.

Pliny[33] speaks of this species as called *onitin* or *prasion* in the first century, but its introduction to Britain is said to have taken place in 1759.[32] It was in American gardens in 1806,[27] but does not appear to have been much cultivated, although recorded by Burr in 1863. Its name does not now occur in our seed-lists, as it is inferior to the preceding variety.

This species has been called *pot marjoram,* a name which has been applied to the *O. vulgare.*

Origanum heracleoticum L.

This species has been identified with the *Cunila gallinacea* of Pliny.[34] It is mentioned in the early botanies, and is said to have reached England in 1640,[35] and is recorded in American gardens in 1806.[36] It finds mention by Burr in 1863, but seems now to have disappeared from our seed-lists. It is frequently mentioned by early garden writers under the name of *winter sweet marjoram,* and has a variegated variety.

[26] McIntosh. Book of the Gard., II., 238, 239.
[27] McMahon. Am. Gard. Cal., 1806.
[28] Vilmorin. L. c.
[29] Schubeler. Culturpf., 89
[30] Pickering. L. c., 248.
[31] Bojer. Hort. Maur., 248.
[32] Don. Gard. and Bot. Dict., IV., 767.
[33] Pliny. Lib. XX., c. 67.
[34] Pliny. Lib. XX., c. 62.
[35] McIntosh. L. c., II., 238.
[36] McMahon. L. c.

SWEET POTATO. *Convolvulus batatas* L.

This widely distributed cultivated plant, originally of South and Central America, had developed many varieties at the period of its discovery by Columbus. Peter Martyr[37] in his second decade, written about 1514, mentions *batatas* as cultivated in Honduras, and in his third decade he gives the names of nine varieties. In 1526 Oviedo[38] not only mentions sweet potatoes in the West Indies, but says they have often been carried to Spain, and that he had carried them himself to Avila, in Castile. In Peru, Garcilasso de Vega[39] says the "apichu" are of four or five different colors, some red, others yellow, others white, and others brown, and this author was contemporary with the conquest. The "camote" of Yucatan, called in the islands *axi* and *batatas*, is mentioned in the fourth voyage of Columbus,[41] and Chanca, physician to the fleet of Columbus, in a letter dated 1494, speaks of *ages* as among the productions of Hispaniola. In Europe, sweet potatoes are mentioned by Cardan[42] in 1556, and Clusius,[43] in 1566, describes the red or purple and the pale or white sorts as under culture in Spain, and in 1576 he notes that their culture had been attempted in Belgium. Their mention hereafter in the early botanies are frequent. Their culture is noted for Virginia before 1650.[44] In 1750 Hughes[45] says that at least thirteen sorts are known at the Barbadoes, and Wilkes[46] notes that in the Hawaiian Islands, where the sweet potato had been introduced, there are thirty-three varieties, nineteen of which are of a red color and thirteen white. On the Mauritius, Bojer[47] describes the round and long forms, white and purple. At the present time Vilmorin[48] describes two varieties in France, and in

[37] Peter Martyr. Eden's Hist. of Trav., 1577, 88, 143.
[38] Oviedo. Quoted by Gray and Trumbull, *Am. Jour. Sci.*, April, 1883, 248.
[39] G. de Vega. Roy. Com. Hak. Soc., Ed. II., 359.
[40] Gen. Coll. of Voy. by the Port., 1789, 440.
[41] Pharmacographia, 1879, 452.
[42] Cardanus. De Rerum Var., 1556, 189.
[43] Clusius. Hisp., 1576, 297.
[44] Virginia. By E. W., 1650.
[45] Hughes. Barbadoes, 1750, 228.
[46] Wilkes. U. S. Exp. Exp., IV., 282.
[47] Bojer. Hort. Maurit., 225.
[48] Vilmorin. Les Pl. Pot., 401.

1863 Burr [49] describes nine varieties as in American gardens. Of the varieties now known to me, not one type can be considered as modern in its appearance.

The *sweet potato* is called in France, *potate douce*, *batate*, *artichaut des Indes*, *truffe douce;* in Italy, *patata;* in Spain and Portugal, *batata*.[48]

Other names have been, in English, in 1597, *potatoes*, *potatus*, and *potades* (Ger.); by Clusius, 1576, *batatas*, *camotes*, *amotes*, and *ajes*.

Native American names are, in Peru, *apichu* (Piso. de Vega); at Quito, *cumar* (Markham); in Brazil, *jetica* (Piso. Marcg.), *jettiki* (Hans Stade); by the Portuguese in Brazil, *batata* (Marcg.), *patattes* (Nieuhoff); in Mexico, *camote* (Unger); in Carib, *maby* (Descourt.); in Tupi, *hetich* (Gray); in Tupi-Guarani, *yeti* (Gray); in Yucatan, *camote* (Port. Voy.); in Choctaw, *ahe* (Gray).

Other names are, in New Zealand and Otaheite, *cumala* (Cook); in New Zealand, *kumara* (Wilkes); in Malay, *ubitora;* Javanese, *ubi;* Chinese, at Batavia, *hantsoa* (Nieuhoff); Central Africa, *veeazee* (Grant); East Africa, in Wanika-land, *fiasi* (Krapf.); in the Soudan, *dankali*, *doukali* (Heuze).

In India, *shukar-kundo* (Firm.); in Bengali, *shukar-kundoo-aloo;* in Telinga, *chillagada*, *grasugada* (Drury); in Hindustani, *pendaloo;* in Tamil, *sukkaray-vullie;* in Ceylon, *batala;* in Persian, *zardak-lahori;* in Malay, *batatas* (Birdwood); in Japan, *imo*, *kara imo* (Thunb.).

TANSY. *Tanacetum vulgare* L.

Tansy is still included in the herb-garden as a condimental and medicinal herb, yet it is very little grown, the wild plant usually sufficing for all purposes, and it very readily becomes an escape, thriving in out-of-the-way places without culture. It was formerly in greater esteem than at present. In 1633 Gerarde [50] says: "In the spring-time are made with the leaves hereof newly sprung up, and with egs, cakes, or tansies, which be pleasant in taste, and good for the stomacke." In 1778 Mawe [51] says: "This

[49] Burr. Field and Gard. Veg., 1863, 99.
[50] Gerarde. Herbal, 1633, 651.
[51] Mawe. Gard., 1778.

herb for its economical uses in the kitchen and medicine merits culture in every garden," and names for varieties the plain-leaved, the curled-leaved, the variegated-leaved, and the scentless. Both the common and the curled are figured by Dodonæus [52] in 1616, and are mentioned in other botanies of this period. It was in American gardens before 1806.

Tansy [53] or *tansie* [54] is called in France, *tanaisie, barbotine, herbe amere, herbe aux vers, tanacee;* in Germany, *gemeiner rainfarn, revierblume, wurmkraut;* in Denmark, *reinfang;* in Italy, *atanasia, tanaceto, erba santa-maria;* in Spain, *tanaceto.*[55]

TARRAGON. *Artemisia dracunculus* L.

This plant, widely spread over South Russia, was brought to Italy, probably from the shores of the Black Sea, in more recent times. The first mention on record is by Simon Seth, in the middle of the twelfth century, but it appears to have been scarcely known as a condiment till the sixteenth century.[55] The leaves make an excellent pickle, and are sometimes used in soups and salads. The flowers, as Vilmorin says, are always barren, so the plant can only be propagated by division. Its culture is mentioned by the botanists of the sixteenth century, and in England by Gerarde [56] in 1597, and by succeeding authors on gardening. Rauwolf,[57] 1573–'75, found it in the gardens of Tripoli. In America it is mentioned by McMahon [58] in 1806.

Tarragon is called in France, *estragon, absinthe estragon, dragonne, fargon, herbe dragon, serpentine, torgon;* in Germany, *dragon, bertram, esdragon, schlangenkraut;* in Flanders and Poland, *dragonkruid;* in Denmark, *estragon, kaisersalat;* in Italy, *dragoncello, targone, serpentaria;* in Spain, *estragon;* in Portugal, *estragas.*[59]

[52] Doronæus. Pempt., 1616, 36.
[53] Vilmorin. Les Pl. Pot., 1883, 552.
[54] Turner. Libellus, 1538.
[55] Targioni-Tozzetti. Hort. Trans., 1854, 148.
[56] Gerarde. Herb., 1597, 193.
[57] Gronovius. Orient., 106.
[58] McMahon. Am. Gard. Cal., 1806, 511.
[59] Vilmorin. Les Pl. Pot., 207.

THYME. *Thymus vulgaris* L.

A plant native to the southern countries of Europe, and which has been long cultivated in more northern countries. In English culture it is recorded about 1548,[60] and it is mentioned by Gerarde in 1597, and succeeding authors. It succeeds as an annual even in Iceland,[61] and is recorded as grown in the tropical gardens of the Mauritius.[62] Three varieties are known: the narrow-leaved, *Thymus vulgaris, tenuiore folio* of Bauhin,[63] 1596; the broad-leaved, *Thymus vulgaris, latiore folio* of Bauhin,[63] 1596; and the variegated, *Thymus variegato folio* of Tournefort,[64] and also mentioned by Bauhin [65] in 1623. It was known in American gardens in 1806 [66] or earlier, and the broad-leaved kind is the one now principally grown in the herb-garden for use in seasonings.

The *common, French,* or *narrow-leaved thyme* is called in France, *thyme ordinaire, faligoule, farigoule, frigoule, mignotese du Genevois, pote, pouilleux;* in Germany, *franzosischer thymian;* in Flanders, *thijmus;* in Holland, *tijm;* in Denmark, *thimian;* in Italy, *timo, pepolino;* in Spain, *tomillo;* in Portugal, *tomilho;* [67] in Norway, *timian;* [68] in Arabic, *hasha;* in Hindustani, *ipar;* [69] in India, *espar.*[70]

Thymus serpyllum L.

This is a very variable plant, occurring wild in Europe, and sparingly naturalized in some localities in Northeastern America. In 1726 Townsend [71] speaks of it in English gardens, but not as a pot-herb; but it is placed among American pot-herbs by McMahon [66] in 1806. At the present time it is occasionally used

[60] Booth. Treas. of Bot.
[61] Pharmacographia, 1879, 487.
[62] Bojer. Hort. Maur., 1837, 248.
[63] Bauhin. Phytopin., 1596, 414.
[64] Tournefort. Inst., 1719, 196.
[65] Bauhin. Pin., 1623, 219.
[66] McMahon. Am. Gard. Cal., 1806.
[67] Vilmorin. Les Pl. Pot., 553.
[68] Schubeler. Culturpf., 89.
[69] Birdwood. Veg. Prod. of Bomb., 66, 243.
[70] Speede. Ind. Handb. of Gard., 182.
[71] Townsend. Seedsman, 1726, 35.

for seasoning in England. In Iceland it is used to give an agreeable flavor to sour milk.[72]

Wild thyme or *mother of thyme* is called also in Britain, *pell-a-mountain;* in France, *serpolet;* in Germany, *quendel;* in Italy, *sermollino, selvatico, serpillo;* in Yemen, *saater*.[73]

Thymus citriodorus Pers.

This plant is considered by many botanists as but a variety of the preceding. It was described by Bauhin in 1623, and was in American gardens in 1806. The odor of the leaves is quite agreeable, and it is thought to be a desirable seasoning for veal.

Lemon thyme is the *thyme citronne* of the French.

TOMATO. *Lycopersicum* sp.

The earliest mention I find of tomatoes is by Matthiolus[74] in 1554, who calls them *pomi d'oro*, and says they have but recently appeared [in Italy]. In 1570, Pena and Lobel[75] give the name *gold apple* in the German, Belgian, French, and English languages, which indicates their presence in those countries at this date. In 1578 Lyte[76] says in England they are only grown in the gardens of "Herboristes." Camerarius in his Epitome, 1586,[77] gives the French name of *pommes d'amours*, which corresponds to Lyte's *amorous apples;* and in his Hortus Medicus, 1588,[78] gives the names as *pomum Indum*, and the foreign name of *tumatle ex Peruviana;* but Guilandinus of Padua in 1572 had the name *tumatle americanorum*, and Anguillara in 1561 names them *poma Peruviana*.[79] In Hernandez's history of Nova Hispania, 1651, he has a chapter on the *tomatl*, which includes our tomatoes and alkekengis, and in 1658 the Portugese of Java used the word

[72] Burgsman. Gard. Chron., Dec. 25th, 1886, 810.
[73] Pickering. Ch. Hist., 272.
[74] Matthiolus. Com., 1558, 479; 1570, 684.
[75] Pena and Lobel. Adv., 1570, 108; 1576, 108.
[76] Lyte's Dodœns, 1578, 508.
[77] Camerarius Epit., 1586, 821.
[78] Camerarius. Hort., 1588, 130.
[79] Gray. *Am. Jour. of Sc.*, Aug., 1883, 128.

tamatas.[80] Acosta,[81] however, preceding 1604, used the word *tomates*, and Sloane,[82] in 1695, *tomato.*

Both the yellow and the red-fruited are named by Matthiolus[74] in 1554, but the prevalence of the name *golden apple* in the various languages would indicate that this was the color most generally distributed. The shades are given as golden by Matthiolus 1554, ocher yellow by J. Bauhin[83] in 1651, and deep orange by Bryant[84] in 1783. I give only the first authors when the color is mentioned, and do not follow with succeeding authors, who are many.

The red color is noted by Matthiolus,[74] 1554, the pale-red by Tournefort[85] in 1700, and the purple-red in the Adversaria,[75] 1570.

The white-fruited is named by Lyte[76] in 1578, by Bauhin[86] in 1596, etc.

The versicolored by J. Bauhin[83] in 1651.

The bronze-leaved is indicated in Blackwell's Herbarium,[87] 1750.

The cultivated species, following Dunal,[88] are *Lycopersicum pimpinellifolium* L., *L. pyriforme* L., *L. humboldtii* L., *L. cerasiforme* L., and *L. esculentum* L. If these species are well founded, then it seems as if an additional species should be formed which hould include our globular, smooth, unribbed sorts, and this we must do if we would follow out the history of the varieties.

Lycopersicum esculentum Dun.

This is the common species, with flattened and more or less ribbed fruit, and is the kind first introduced into European culture, being described in the Adversaria of 1570, as well as by many succeeding authors, and the earlier figures indicate that it has changed but little under culture, and was early known as

[80] Bontius. Ind. Orient., 1658, 131.
[81] Acosta. Hist., 1604, 266.
[82] Sloane. Cat., 1696, 109.
[83] J. Bauhin. Hist., 1651, III., 620.
[84] Bryant. Fl. Diet., 1783, 212.
[85] Tournefort. Inst., 1719, 150.
[86] Bauhin. Phytopin., 1596, 302.
[87] Blackwell. Herb., 1750, t. 133.
[88] Dunal. Solanaceæ, III.

now in red, golden, yellow, and white varieties, and a parti-colored fruit is mentioned by J. Bauhin in 1651, and the type of the bronze-leaved by Blackwell in 1770. It was probably the kind mentioned by Jefferson [89] as cultivated in Virginia in 1781, as it was the kind whose introduction into general culture is noted from 1806 to about 1830, when their growing was becoming general.

It has the following synonymy, gained from figures:

Poma amoris, an Glaucium Diosc. Lob. obs., 1576, 140.

Poma amoris. Lyte's Dod., 1578, 440. Cam. Epit., 1586, 821; Ger., 1597, 275; Swert., 1654, t. 20, p. 2.

Poma aurea. Lugd., 1587, 628.

Poma amoris, pomum aureum. Lob. ic., 1591, I., 270.

Solanum pomiferum, fructu rotundo, molli. Matth. op., 1598, 761.

Poma amoris fructu luteo et rubro. Hort. Eyst., 1613; 1713.

Aurea mala. Dod., 1616, 458; 1583, 455.

Pomi d'oro. Cast. Dur., 1617, 372.

Pomum amoris majus. Park. Par., 1929, 381, f. 3.

Amoris pomum. Blackw., 1750, t. 133.

Mala aurea. Chabr., 1677, 525. J. B., 1650, 3, 620.

Solanum pomiferum. Mor. Hist., 1699, s. 13, t. 1, f. 7.

Lycopersicon. Tourn., 1719, t. 63.

Lycopersicon galeni. Morandi, 1744, t. 53, f. 8.

Common Large Red. Mawe, 1778.

Morelle pomme d'amour. Descourt., 1827, VI., 95.

Tomate rouge grosse. Vilm., 1883, 555.

Large Red. Burr, 1863, 646.

In form these synonyms are substantially of one variety. The descriptions accompanying and others of the same date mention all the colors now found. In 1719 Tournefort names a pale red, red, a yellow, and a white variety in France, and in 1778 Mawe but the common large red in England. In 1854 Brown describes but two varieties, the large red and the large yellow, for American gardens. The *Lycopersicum esculentum* L. is said by Bojer to grow spontaneously in the Mauritius [as an escape].

[89] Jefferson. Notes, 1803, 54.

Lycopersicum rotundum.

I here place the larger unribbed round or oval varieties which are now becoming popular, and also the fancy varieties known as the plum, but I would not have it understood that at present I consider this group as forming a true species in the botanical sense, for my studies are not yet sufficiently complete. Of this group there are no indications of their being known to the early botanists, the first apparent reference I can detect being by Tournefort in 1700,[90] who places among his varieties the *Lycopersicum rubro non striato*, and this same variety was catalogued by Tilly[91] at Pisa in 1723. The *non striato* not fluted or ribbed, implying the round form. In 1842 some seed of the Feejee Island variety was distributed in Philadelphia, and Wilkes[92] describes the fruit of one variety as round, smooth, yellow, the size of a large peach, and the fruit of two other varieties as the size of a small egg, but gives no other particulars. This is the first certain reference that I find to this group. The large smooth or round red and the small yellow oval tomato of Browne,[93] 1854, may belong here. Here may be classed such varieties as Hathaway's Excelsior, King Humbert, and the Plum, and some of the *tomate pomme* varieties of the French.

This form occasionally appears in the plants from seed of hybrid origin, as when the cross was made between the currant and the tree tomato, some plants thus obtained yielded fruit of the plum type. This, however, may have been atavism. The botanical relations seem nearer to the cherry tomato than to the ordinary forms.

Lycopersicum cerasiforme Dun.

The cherry tomato is recorded as growing spontaneously in Peru,[88] in the West Indies,[82] Antilles,[94] and Southern Texas.[95] I have also observed it in a railroad cutting in New Jersey. It furnishes red and yellow varieties, and was noted in Europe as

[90] Tournefort. Inst., 1719, 150.
[91] Tillius. Cat, Hort. Pisa, at Pisa, 1723, 106.
[92] Wilkes. U. S. Exp. Exped., III., 335.
[93] Browne. U. S. Pat. Of. Rept., 1854, 385.
[94] Descourtilz. Fl. Ant., V., 279.
[95] Gray. Syn. Fl., II., 226.

early as 1623,[97] and is mentioned in 1783 by Bryant[98] as if the only sort in general culture in England at this time, but Mawe,[99] in 1778, enumerates the large red, as also the red and yellow cherry, as under garden culture. The following is its synonymy, mostly founded on description:

Solanum racemosum cerasorum. Bauh. Pin., 1623, 167; Prod., 1671, 90.

Solanum amoris minus, S. mala æthiopica parva. Park. Par., 1629, 379.

Cujus fructus plane similis erat, magnitudine, figura, colore, Strychnodendro, etc. Recchius Notes, Hernand., 1651, 296.

Fructus est cersasi instar (quoad magnitudine), Hort. Reg. Bles., 1669, 310.

Solanum pomiferum fructu rotundo, molli parvo rubro plano. Ray, 1704, III., 352.

Lycopersicum fructu cerasi rubro. Tourn., 1719, 150.

Lycopersicum fructu cerasi luteo. Tourn., 1719, 150.

Solanum lycopersicum. Bryant, 1783, 212.

Cherry-fruited. Mawe, 1778.

Cherry. Mill. Dict., 1807; Burr, 1863, 649, 652.

Morelle cerasiforme. Descourt., 1827, V., 279, t. 378.

Lycopersicum cerasifolium. Noisette, 1829.

Cherry-shaped. Buist, 1851.

Tomate cerise. Vilm., 1883, 559.

This species is probably the normal form of the tomato of the gardens, to which the other species above given can be referred as varieties. It is quite variable in some respects, bearing its fruit sometimes and usually in clusters, occasionally in racemes. It is but little grown, and then only for use in preserves and pickles.

(*To be continued.*)

RECORD OF NORTH AMERICAN ZOOLOGY.

BY J. S. KINGSLEY.

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EDITORIAL.

EDITORS, E. D. COPE AND J. S. KINGSLEY.

AMONG the many uncritical propositions urged by would-be reformers in recent years, few are more so than some of those anent the interesting subject of women's waists. We are repeatedly told that a narrow waist is a deformity produced by artificial compression, and that the just model for the healthy normal woman is the robust and matronly Venus of Milo. Now the anthropologist knows that this general assertion is not true as applied to the civilized white woman. It is especially characteristic of the highest types of woman of the Indo-European race to have wide hips and a narrow waist, up to the age when adipose tissue fills to greater uniformity of outline, the graceful curve which is so generally admired. It is well known that the form of the pelvis differs in the different races, so that in the white race the female pelvis differs from that of the male more than is the case with the African. In the latter the female pelvic strait is as in the male, longer in anteroposterior than in transverse diameter; in the female Mongolian the strait is subquadrate in outline, while in the Indo-European the strait is oval, with the transverse diameter greater than the anteroposterior. Thus the white woman has wider hips than the woman of inferior races, and she is in so far more unlike the male than they. The larger pelvic cavity of the female is an adaptation to the increase in the bulk of its contents incident to gestation; and it follows that when this cavity is not so occupied, the moveable viscera fill the space. From this results the contraction of the abdominal walls immediately above the pelvis known as the waist. It is then clear that the diameter of the waist is inversely as the diameter of the pelvis, and the differential of diameter is greatest as the transverse diameter of the pelvis exceeds the anteroposterior.

The cause of the increased transverse diameter of the Indo-European pelvic strait is probably mechanical. It may be due

to anteroposterior pressure on the pubic arch. This in turn may be a consequence of the monogamic customs of the Indo-European subspecies due to the greater esteem in which women are held. But on this point we can only speculate.

In any case the Venus of Milo has the form of a very mature woman of her race, and many moderns can boast of far more graceful figures than she. And these figures are not the result of artificial compression of the clothing, but are the product of a natural evolution of form. It is true, however, that all women of the white race have not attained this stage, and not a few retain the figure of lower races. It is not, however, proven that the women possessing this figure are any better child-bearers than those of modern type. Occasionally we meet women who to a robust waist add a narrow pelvis,—an unfortunate structure, and one not likely to be extensively reproduced, owing to the difficult parturition which is indicated.

The women who are not satisfied with the figures which nature has given them, and who endeavor to reduce a naturally robust waist to the proportions which characterize their more favored sisters by artificial means, deserve all the reprobation which the above-mentioned reformers bestow so undiscriminatingly on all alike. Excess of slenderness is not beautiful, and artificial compression forces the viscera into positions which produce a deformity of the abdominal wall more repulsive than a stout waist.—C.

—LABORATORIES of Marine Biology have been established at various localities for the purpose of enlarging our knowledge of animal and vegetable structure, development, and function, and to furnish a headquarters for the instruction of the entire community in all matters connected with increased supply, avoidance of disease, and cultivation of more varieties of sea foods.

Some idea of the extent to which the important bearings of Laboratories of Marine Biology are appreciated and encouraged abroad may be gained from the following list, which will make clear at the same time how much America is behind other nations in giving scientific oversight to one side of the question of cheap and plentiful food supply, a question growing in importance in

direct ratio with the growth of population. The first of the laboratories named in the list, that of Naples, has cost, in permanent plant alone, over $100,000, and is carried on at an annual expense of $20,000. The laboratory and fittings of the English station, at Plymouth, were completed at a cost of over $60,000, raised by subscription. The two Austrian and the eight French stations have been fostered by the intelligent and progressive men of their respective countries, and have given abundant returns in practical contributions to knowledge. The Japanese station has, during its few years of existence, done much to alleviate certain sources of public distress. The following list represents the number of such stations and the countries where they are situated: Italy, 1; Austria, 2; France, 8; Holland, 2; Belgium, 1; Germany, 1; Sweden, 2; Great Britain, 5; Russia, 1; Japan, 1; New South Wales, 1. In the United States we have one at Wood's Holl, Mass., and one under charge of the U. S. Fish Commission, at the same place. In the wide range of our Atlantic and Gulf coasts south of Wood's Holl no station exists.

Through the energy of Prof. C. S. Dolley, of the University of Pennsylvania, and the liberality of Mr. Chas. K. Landis, of Vineland, New Jersey, ground has been obtained at Sea Isle City, Cape May County, N. J., and a commodious building has been erected on it to serve as a station for biological research.

The final establishment of the Laboratory of Marine Biology upon the New Jersey coast is the outcome of a long and careful consideration of ways and means, undertaken by the University of Pennsylvania, to ascertain how it could best meet its own needs and the requirements of biologists at large.

To place the laboratory upon the more northerly New England coast necessitated its closure during the winter months on account of climatic conditions.

To have accepted the offers of suitable properties in Florida, or the Bahama Islands, would have necessitated the absence of a number of the university's staff of naturalists during the collegiate year, when their services are particularly needed at home. Comparative inaccessibility applied to either alternative. The decision in favor of the present location of the laboratories is based upon

the fact that the fauna of the New Jersey shore waters and of its numerous bays and thoroughfares is exceedingly rich, uniting to a degree, greater perhaps than any other locality, the northern and southern marine faunas. The plants of New Jersey are also peculiarly interesting from the standpoint of climatology and geographical distribution. New Jersey occupies a central position as regards the great oyster industries of the country, midway between Rhode Island and Virginia. Access is quick and easy to the greatest centers of oyster consumption and distribution, —viz., Baltimore, Philadelphia, and New York. The desirability of the location is enhanced also from its proximity to three of the greatest intellectual and scientific centers of the country, the University of Pennsylvania, Columbia College, and Johns Hopkins University, enabling the work of the laboratories to be conducted in thorough accord with the university idea, and available to the considerable number of naturalists congregated at these institutions and in the scientific organizations of the three great cities. Ready access to the unsurpassed libraries and collections of these three cities, and particularly to those of the Academy of Natural Sciences of Philadelphia, urged strongly in favor of the present location.

An examination of the U. S. Coast Survey charts will show a gradual widening of the littoral area towards the southern end of New Jersey. This great shoal-water area is the home of myriads of interesting marine animals, and the spawning and feeding grounds of an equally important series of fishes, etc. The numerous bays and the intricate maze of thoroughfares running back through the salt meadows to the mainland are equally interesting from a biological standpoint.

Sea Isle City, situated on Ludlam Island, affords unsurpassed facilities for the utilization of this rich field for investigation. It has direct railroad connection with New York and Philadelphia by numerous fast trains, good harborage for collecting-boats, and Ludlam Bay, with its oyster grounds of several hundred acres, awaiting only the suggestions of the naturalist to replenish them, and counterbalance the short-sighted policy of the oystermen. Sea Isle City is located in an area the hard sand beach of which

shelves in the most gradual manner for a distance of several miles below the sea-level. It is underlaid with a tenacious, black alluvium, representing submerged meadow-land, and from the permanency which this gives it, forms a favorite habitat to mollusks of great number and variety, so much as to have gained the name of "Shell Beach" among the inhabitants of this region.

The scientific staff consists of Professors Dolley (Director), Jayne, Ryder, Wilson, and Cope.

—Attention may be directed to the shortness of the time permitted the meeting of the American Association for the Advancement of Science, to be held in Washington, commencing August the 19th. As originally announced it was to have closed on August the 22d, thus covering only four days, of which three may be regarded as working days. It is then succeeded by a two-days' session of the Geological Society of America. By a new arrangement the two societies now overlap their sessions. Equally inexplicable is the proposition to have the papers of foreign geologists read before this society. Is there a scheme on foot to extinguish the congress? or is this only one more illustration of the confusion of geological ideas that naturally emanates from Washington? We are of the opinion that there is no proper reason for a meeting of the Geological Society in the summer. The meeting during the winter holiday seems to satisfy all requirements.

—It is still far from certain that the execution by electric shock is more humane than that by hanging. No detailed report of the recent execution of four men at the New York State prison has been yet made public, and some of those authorized to make it, appear to have a prejudice in favor of this mode of execution. The only details which have been reported so far include two remarkable statements. One is that these men, as was the case with Kemmler, required two discharges to kill them. The other was that the face of the only one of the four men which was seen by an outsider, was seamed with burns, and that a hole was burned in the leg to the bone. That a portion of the dis-

charge passed over or near the surface of the body of Kemmler was stated in the reports, and the similar statement in this case requires explanation. The sentiment of humanity and decency must be satisfied in this matter.

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RECENT LITERATURE.

Ameghino on the Extinct Mammalia of Argentina.[1]—We have here a monumental work, such as can only be produced under circumstances which seldom concur. The conditions are, first, rich and newly discovered fossiliferous deposits; second, a man who is competent to study and describe them; and third, facilities for publication. Such a coincidence created the Ossemens Fossiles of Cuvier in Europe; a similar state of affairs has produced corresponding works in North America; and now South America has come forward with a history and a historian worthy to take rank with anything that has gone before. The richness of the Pampean beds of Buenos Ayres has been made known to us by Owen and Burmeister, but it has been for Ameghino to bring to our notice the extraordinary wealth of the Miocene and Eocene beds of the Parana and of Patagonia. Indeed, the wealth of Patagonia, of which a few jewels were brought home by Darwin, turns out to be extraordinary, and the explorations conducted by Senor Carlos Ameghino, brother of the author of this book, have been more productive than those of any other known region, those of some parts of North America alone excepted.

The orders of Mammalia most abundantly represented are those of which examples had been already brought to light in a comparatively small number of representatives by previous explorers. The number of genera and species enumerated by M. Ameghino is as follows:

	Genera.	Species.
? Marsupialia,	8	24
Edentata,	70	188
Glires,	71	177
Bunotheria (Creodonta),	8	9
Carnivora,	13	44
Chiroptera,	11	16
Taxeopoda (Litopterna),	14	23
(Quadrumana),	4	4
Toxodontia,	28	71
Diplarthra (Perissodactyla),	7	14
(Artiodactyla,	18	46
Cetacea,	13	17
Incertæ sedis,	4	4
Proboscidia,	1	6
Total,	286	643

[1] Contribucion al Conocimento de los Mamiferous Fosiles de la Republica Argentina etc., por Florentino Ameghino. Tomo VI., Actos de la Academia Nacional de Ciencias de la Republica Argentina en Cordoba. Buenos Ayres, 1889. Folio, pp. 1027, with Atlas.

The most important results achieved by M. Ameghino are as follows: First, the discovery and definition of numerous marsupialoid or multituberculate forms from the Eocene of Patagonia; second, the discovery of Creodonta in the same region and horizon; third, the discovery of Edentata with enamel bands on the teeth; fourth, the definition of the suborder Litopterna, and discovery of new types; fifth, the completed definition of the order Toxodontia. To these points may be added as only second to them in importance the discovery of Eocene forms of Edentata with superior incisor teeth, and the great additions to the number of forms of Edentata, Glires, and Toxodontia.

The marsupialoid forms are of great interest. Abderites resembles the Plagiaulacidæ, while in Epanorthus we have a type which shows how the singular cutting premolar of this type or that of the Marsupialia Diprotodonta may have been derived from a primitive tuberculosectorial tooth. The occurrence of these forms in the Eocene of Patagonia is a fact of great significance, and M. Ameghino regards them as true Marsupialia, and the ancestors of the Diprotodonta of Australia.

The Creodonta mostly repose on the evidence of imperfect material. Some of them have a simple dentition, and much remains before their true affinities can be determined.

The suborder Litopterna deserves more detailed notice, and we give it in another place in the NATURALIST. It is a most interesting modification of the Condylarthra, showing variations in dental and foot structure parallel with those seen in the Perissodactyla, with which I think M. Ameghino wrongly combines them.

The light thrown on the structure of the Toxodontia is most important. The structure of the posterior feet has been hitherto but partially known, and that of the fore feet entirely unknown. M. Ameghino shows that the former are taxeopodous, and the latter amblypodous, proving conclusively the claim of the Toxodontia to be regarded as a distinct order of ungulate Mammalia. An important feature of this book is the number of new genera allied to Mesotherium which are described and figured.

The great number of Glires described is remarkable. It is interesting to observe that they correspond with existing forms of South America, the Chinchillidæ and Caviidæ being most numerous, even in Eocene times, while the Leporidæ are very few, and present only in the latest beds.

As a general result of M. Ameghino's work it is now possible to announce the following conclusions: The extinct Mammalia may be

referred to three categories; first, the orders which have been mainly restricted to the Southern Hemisphere, and have originated there,—the Edentata, the Toxodonta, the Litopterna; second, cosmopolitan orders,—Glires, Chiroptera, Marsupialia, Perissodactyla; third, orders which have come from the Northern Hemisphere at a comparatively later period of geologic time,—Carnivora, Proboscidia, and Artiodactyla. The further history of the origin of the truly Antarctic types will be awaited with the greatest interest.

An atlas of 98 plates accompanies the text. The figures have been executed under the careful eye of the author, and express the characters referred to in the text. The great expense involved in their production has made it necessary to employ some phototype process, which can not give as good artistic effects as lithography.

We congratulate M. Ameghino on the completion of this great work. We also congratulate the country which has produced it. It is works of this character which give a nation its intellectual standing in the world. Henceforth Argentina will be known to science as a country which has added one of the largest and most important contributions to its temple of life.—E. D. Cope.

Furbringer's Researches on the Morphology and Systematic of Birds.[2]—This is a work of great thoroughness in the field which it covers. It is divided into two parts, each included in a volume; the first describing the anterior limb and shoulder girdle, and the second being a comprehensive review of the characters and systematic relations of birds. In the first volume the osteology, myology, and neurology are thoroughly described, and the illustrations cover the plates at the end of the second volume. The characters of many species are for the first time described and figured. In the second volume the work already done in bird anatomy is reviewed, both zoology and paleontology being thoroughly examined. The systematic results are set forth in tables. In one of these the structural characters are tabulated. In another the divisions down to families inclusive are displayed. We give this table, exclusive of the families, as exhibiting concisely the author's views. Two phylogenetic trees follow. On three succeeding plates three horizontal sections of these trees are given, which display the affinities of higher and lower forms in an expressive manner.

[2] Untersuchungen zur Morphologie u. Systematic der Voegel; Zugl. ein Beitr. zur Anatomie der Stütz und Bewegungsorganen; von Max Fürbringer. Amsterdam Zj. von Halkema, 1888; 2 vols. folio, pp. 1751.

CLASSIS AVES.

Order.	Suborder.	Genus.
I.—Subclassis SAURURÆ.		
ARCHORNITHES	Archæopterygiformes	Archæopteryges
II.—Subclassis ORNITHURÆ.		
STRUTHIORNITHES	Struthioniformes	Struthiones
RHEORNITHES	Rheiformes	Rheæ
HIPPALECTRYORNITHES	Casuariiformes	Casuarii
	Æpyornithiformes	Æpyornithes
	Palamedeiformes.	Palamedæ
PELARGORNITHES	Anseriformes	Gastornithes
		Anseres
	Podicipitiformes	Enaliornithes
		Hesperornithes
		Colymbo-Podicipites
	Ciconiiformes	Phœnicopteri
		Pelargo-Herodii
		Accipitres
		Steganopodes
	Procellariiformes	Procellariæ
	Aptenodytiformes	Aptenodytes
	Ichthyornithiformes	Ichthyornithes
CHADRAORNITHES	Charadriiformes	Laro-Limicolæ
		Parræ
		Otides
	Gruiformes	Eurypygæ
		Grues
	Ralliformes	Fulicariæ
		Hemipodii
ALECTORORNITHES	Apterygiformes	Apteryges
	Crypturiformes	Crypturi
	Galliformes	Galli
	Columbiformes	Pterocletes
		Columbæ
	Psittaciformes	Psittaci
CORACORNITHES	Coccygiformes	Coccyges
		Galbulæ
	Pico-Passeriformes	Pico-Passeres
		Makrochires
		Colii
		Trogones
	Halcyoniformes	Halcyones
		Bucerotes
		Meropes
		Todi
	Coraciiformes	Coraciæ
		Caprimulgi
		Striges

The complex characters of bird affinities are well displayed in these graphic methods. It is rendered partly clear that in a great many instances nothing but actual paleontological discovery will reveal the true connections.

Dr. Fürbringer's work, besides being a treasury of bird anatomy and character, introduces us to the literature in a most exhaustive way. Nothing has escaped him. We seem to be in the presence of all the workers who have contributed to the systematic of birds from the beginning. All are recognized, and the share of each in the work is duly recorded. As a standard of information on scientific ornithology the book will always hold a first rank.

Miller's North American Geology and Paleontology.[3]— This work is an alphabetically arranged index of the genera and species of Paleozoic plants and animals. The only scientific division of the catalogue is that into classes. The names of the genera and species are accompanied by one reference to a description, and frequently by a good figure. The work opens by a general geologic description, including the Mesozoic and Cenozoic formations, and by an enumeration of the rules of nomenclature.

The work is an exceedingly useful one for reference. The alphabetic arrangement makes it necessary that one should know beforehand what he wants to find. It is hence useful chiefly to the scientist. For the purposes of the student such a work should be systematically arranged throughout.

Some fault may be found with the description of the Cenozoic beds of the interior of the continent in a few particulars. Thus it is stated that the Wind River beds are Miocene, when they are Eocene, and the Loup Fork beds are said to be Pliocene, when they are Upper Miocene. Miocene and Pliocene pass into each other so completely, however, that the names should be abolished, and the word Neocene used in their stead. We only notice one serious objection to the systematic presentation of the subject, and that is in the land Vertebrata. Here the Batrachia and Reptilia are mixed together under the head of Batrachia, an error for which it is difficult to account, since the distinction between the two classes has been maintained by the describers of their respective contents. In the matter of etymology of names, the present work is mainly up to the requirements of the subject. The book is one which the working paleontologist cannot do without.

[3] North American Geology and Paleontology, for the Use of Amateur Students and Scientists. By S. A. Miller. Cincinnati, 1889, pp. 664, 8vo.

Bergen's Primer of Darwinism.[4]—This little book is a convenient one to put into the hands of a preliminary inquirer on the subject of evolution. It takes up successively the variability of species, the systematic order, and the parallels between the ontogeny and phylogeny. A number of illustrations elucidate the subject-matter. The authors have not gone into the discussion of the origin of variation, and of the Neolamarckian and Neodarwinian schools, nor into the question of inheritance of acquired characters. As far as it goes, the book is an excellent one.

Morris on Civilization.[5]—The history of civilization is the history of mankind written from the utilitarian standpoint, rather than from the heroic or romantic. It is the real history, the one which will take the place of all others in our institutions of learning when our teachers have sufficiently escaped from tradition and custom. History as now taught is largely political history, where the occupations of the great majority of mankind are neglected, and in which the deeds of mankind which were best worth doing are unrecorded. Mr. Morris's book is a comprehensive synopsis of the progress of man in all his activities, occupying twenty-four chapters. He treats of population, government, religion, law, philosophy, commerce, wealth, science, art, and education. The erudition necessary for the production of such a work is encyclopædic, and we may say that the work is well done considering the limited space at the author's disposal. His own views are in touch with modern humanitarianism and modern thought, and his unobtrusive presentation of them appears to be the natural outcome of the logic of each subject as it arises. A more definite reference to authorities would have added greatly to the value of the work.

[4] A Primer of Darwinism and Organic Evolution. By J. Y. Bergen, Jr., and Fanny D. Bergen. Boston, 1890, Lee & Shepard. 8vo, pp. 260.

[5] Civilization: A Historical Review of its Elements. By Charles Morris. Chicago, 1890, S. C. Griggs & Co. 8vo, 2 vols., pp. 1000.

General Notes.

GEOGRAPHY AND TRAVEL.

A Visit to the Philippine Islands of Masbate and Marinduque.—On the first of May, 1888, after a month's stay in the Eastern Philippines, we sailed from the port of Catbalogan, in the island of Samar, bound for the island of Masbate. Our vessel was a stout little brig called the "Salvamiento," built in the islands, manned by a crew of Indians, and commanded by a Spanish captain. Our cargo was abaca (manila hemp), for the Manila market, and our only fellow-passenger was an old Indian sergeant going up to Manila on furlough. The southeast trades were just beginning to blow, and we set sail at sundown. The month in the eastern islands had been one of the hardest we had passed, with the jealousy of the authorities, poor food, the beginning of the rainy season, and a most difficult and mountainous country to hunt over, and we were pleased enough to be once more turned towards the north and home. The evening was pleasant, and we sat in the moonlight on the deck far into the night listening to the old sergeant's stories, and then turned in to sleep in a shake-down of sails on the cabin floor.

The next morning found us still moving leisurely along under the same gentle breeze, and in the common highway from the Eastern and Central Philippines towards Manila. Islands were in sight on both sides all day, most of them more or less cultivated. In the afternoon we reached the southern point of Masbate, and sailed along the eastern shore. The country looked bare and brown enough. Most of it was campo, a rolling prairie, covered with coarse grass, now parched with drouth, and in many places blackened with fire.

Just at night we turned into the little harbor of Palanoc and dropped anchor, the captain saying that he would wait and put us ashore in the morning, so that we might have time to hunt a house to stop in. He then took me ashore in his boat, and we climbed the steep bank of sixty or eighty feet, up to the little town, and there, guided by the moonlight, along a little crooked street to a low shop kept by a Chinaman, in which were an antiquated billiard table and a bar, and where were assembled the four or five Spaniards who made up the official corps of the island; for Masbate is a province, and Palanoc its capital. The captain introduced me as "Un señor naturalista Americano,"

and an old, grizzled officer in half-military dress began to tell remarkable stories of a young American naturalist whom he knew in the islands many years before. I finally made out to recognize myself in one of these stories, and the old man as an officer whom I had met and stopped with in the island of Basilan in "'74." He was acting governor of Masbate now, and the next morning put the whole establishment at our service. We were too many to accept his hospitality, and he ordered the school-house, which was closed for a vacation, to be put at our disposal. The palm thatch was in bad repair, but we had left the oncoming rainy season behind at our last stopping place, and the tables and benches served us well for our work. Several prisoners in chains were sent to transport our baggage up the steep hill, and we moved in immediately and got over breakfast in our new home while the "Salvamiento" was slowly making her way out of the harbor. The same day several of our party got out to some patches of woods not far away, and found the country so dry that great cracks ran through the soil in every direction. Birds of several kinds, especially parrots and cockatoos, were abundant. All the birds brought in had a familiar look, and the next day the same; and there was now no doubt of it, we had struck another island of the central group, and the birds were identical with those of Panay and Negros. Masbate is distant enough from these to have a fauna of its own, but a study of the sea-bottom will probably show shallows which have not long ago connected it with the other central islands. After we had spent four or five days at Palanoc, and just as we were planning a trip into a wilder and better-timbered part of the island, the steamer "Taal" came into the harbor, and began loading with cattle for Manila. We found she would touch at Marinduque, our next stopping place, on her way, and, after a hurried consultation, concluding we could add but little of value to our collections from Masbate, we packed our goods and got on board the same evening, some of the woodsmen bringing us a few fine tree snails while we were on our way to the steamer. The species of land and tree snails of the Philippines are more restricted in distribution than even the short-winged birds.

The next morning found us well on our way, and passing through a multitude of islands, several of them of considerable size and importance. The southeastern extremity of Luzon was also in sight, and the famous volcano of Albay.

We arrived at the port or roadstead of Boac, in the island of Marinduque, just at night again, and we and our baggage were set ashore just before dark. The town was several miles away, but a few houses,

forming a little fishing village along the road leading up to it, were the sight among cocoa groves. The inhabitants of the place were an inhospitable lot, and, failing to make terms with them, we camped for the night on the beach, among our baggage. The next morning, concluding the port to be better fitted for our purpose than the inland town, we hired a little house just big enough to put a table into and to hang up our hammocks, and moved in, and, hiring an Indian boy as cook, were ready to look about us. The country along the coast was level and sandy, and much of it planted in cocoa groves, the rest showing ditches and banks made for irrigating rice, though the fields were now dry and grown up to grass and weeds, the last year having been too dry to raise rice. Troops of horses were feeding over these plains. Behind this level land the country rose up in low hills, which were rocky and covered with thick bushes. The only virgin forest in sight was several miles away, inland, and on steeper, higher hills.

The birds shot in the cocoa groves about us proved to be distinct, many of them, from any we had as yet procured, though we afterwards found them to be identical with those of the great island of Luzon.

There had been a gradual increase in the number of species of birds found nesting since February, but we now found nearly all species in the full tide of nesting. It seems strange that this should agree so closely with the nesting season in the north temperate regions. Bee-birds, kingfishers, cuckoos, shrikes, fruit-thrushes, orioles, fly-catchers, sun-birds, crows, starlings, pigeons, rails, herons, ducks, parrots, and cockatoos were all nesting. When the natives heard that we had cash to pay for such things, we were fairly besieged with boys and girls and women, with birds' nests and eggs, and land and tree snails. The ladder leading up to our room usually had two or three people upon it, who would hold up their collections whenever any of us came in sight. The native name of the bird was always required, and the nest with the eggs as far as possible. One day an old woman brought a basket with a number of round, white eggs, new to us. She was required to bring the nest to which the eggs belonged before being paid, but said the nest was a "pogo," and was then told to bring along the "pogo." A few days after we found that the eggs were those of the beautiful *Merops bicolor*, the prettiest of the two Philippine bee-eaters, and that they are laid in a hole in the ground, and this was the "pogo" we had demanded of the old woman.

The number of birds building nests in holes here seemed to me to be rather remarkable. Among these were the bee-eaters, kingfishers,

swallows, shrikes, two species of starlings, cockatoos, parrots, owls, woodpeckers, and hornbills. But for the help of the natives our collections would have been poor; but the island seems over-populated, at least for the methods of cultivation used, and the people were anxious to get our money. Among the animals brought us were two of the curious Philippine rats (Phlœomys). They were nearly as large as our common gray rabbit, light-gray in color, with short black tails. They were brought living, tied together to a stick, and had nearly cut each other to pieces before we received them.

A trip down the beach to the south two or three miles brought us to a small creek flowing out of the hills, and following this up we found some woodland in the steep ravines, and many birds, among them two species of beautiful pittas, in abundance, and further above, a few of the great hornbills (*Buceros hydrocorax*), and the curious crested cuckoos (Dasylophus), before supposed to be limited to Luzon. At about the same distance to the north there was a tract of lowland, much of it planted in rice, which was now being harvested, and here all kinds of waders were abundant,—rails and gallinules and herons of several species, most of them nesting, and a few Philippine mallards. Along the sea beach were thickets of small timber, and upon these we found one of the prettiest of the Philippine tree snails quite abundant, while the natives brought us from further inland quantities of *Bulimus philippenensis* and *woodianus*, two of the largest and finest species in the islands. The weather, which was dry when we arrived, gradually changed. Rain-clouds gathered over the hill-tops, and before the close of the month we had several heavy showers, and the rainy season had begun, and we prepared to move before it again,—this time to the little-known island of Mindoro, which was in sight across the strait, twelve or fifteen miles away.—J. B. Steere, *Ann Arbor, Mich.*

GEOLOGY AND PALEONTOLOGY.

Elevation of America in the Cenozoic Periods.—Mr. W. H. Dall writes as follows to the *Geological Magazine* for May, 1891:

"I notice in recent numbers of the *Geological Magazine* that Mr. Upham has been discussing his views on the elevation of the Gulf of Mexico, etc. It seems a pity that gentlemen who desire to launch such startling hypotheses should not devote more time to settling the facts upon which these hypotheses are based before promulgating their new views. As the statements made by Mr. Upham may be taken as properly verified, and more confusion be thereby occasioned, permit me to call attention to a few facts which have been verified.

"1. The late Dr. Maack, when on the Isthmus of Darien, did not collect any Pleistocene fossils from the summit of the Atrato divide, 763 feet above the sea. 2. The Pleistocene fossils collected by Dr. Maack were from an elevation of only 150 feet on the Panama side, ten miles from Panama City. The fossils above this height collected by Dr. Maack are Eocene or Miocene exclusively, and related to the Miocene fauna of Santa Domingo, as indeed was pointed out by Gabb nearly twenty years ago (Proc. Am. Philo. Soc., Vol. XII., p. 572). 3. The summit or dividing line is not fossiliferous, and is probably not later than the Mesozoic epoch.

"I may add, from information to be shortly published, that the supposed great elevation of Florida at any time since the later Eocene is as improbable as any hypothesis which could well be conceived. The conclusions which the facts necessitate in the case of Florida may be briefly outlined as follows: During the later Eocene, West-Central Florida was an island, like one of the Bahamas at present, composed exclusively of organic marine sediments, which in the Vicksburg epoch attained an unbroken thickness of more than 1,000 feet. The whole submarine plateau above which the present Florida rises may turn out to be of this age and constitution. This island had a land-shell fauna derived from the south. The strait between the island and the main coast north of it was more than fifty miles wide at the narrowest point, and was only closed at the beginning of the Pliocene. There have been gentle changes of level since the Eocene, but nothing violent, and the vertical range has been small. The Eocene and the old Miocene faunas were of a subtropical character, like the Antillean fauna at present. A change took place in mid-Miocene by which a cool, temperate, or colder water fauna invaded the Floridan region

from the north, and about 200 feet of strata (Chesapeake Group) were deposited, equivalent to the well-known Miocene beds of Virginia and Maryland. With the elevation which connected the Floridan islands with the continent a warmer era was again inaugurated in the sea, and an invasion of Pliocene vertebrates began on the peninsula of Florida.

"There were unquestionably great changes of level on the continent, increasing as one goes northward, both in Miocene and Pleistocene times. In the Antilles it has been proved that great changes have taken place. But the Floridan region, for some unknown reason, escaped, and Yucatan probably also.

"I have been making a special study of Floridan geology for some years, and hope to publish a considerable amount of new information on that subject during the coming summer."

Discovery of Coal near Dover, England.—In the *Contemporary Review*, April, 1890, Professor W. Boyd Dawkins gives a history of the discovery of coal in Southeastern England. As far back as 1826 Buckland and Conybeare recognized the physical identity of the coal-bearing districts of Somerset on the west with those of Northern France and Belgium on the east. In 1855 Godwin-Austen showed that the general direction of the exposed coal fields in South Wales and Somersetshire and those of North France and Belgium was ruled by a series of folds running east and west parallel to a great line of disturbance centered in the "axis of Artois," and concluded, from a careful study of the region, that there are coal fields beneath the Oölitic and Cretaceous rocks in the south of England, near enough to the surface along the ridge to be capable of being worked. His views were reinforced by Prestwich, in a report made to the Coal Commission of 1866–'71. At length, in consequence of a report made by Mr. Dawkins to Sir Edward Watkin, chairman of the Southeastern Railway and the Channel Tunnel Company, a shaft was sunk on the west side of Shakespeare Cliff, near Dover, to the depth of forty-four feet, and from the bottom of this a bore-hole has been made to the depth of 1,180 feet. The Coal Measures were struck at a depth of 1,204 feet from the surface, and a seam of good blazing coal was met with twenty feet lower. This discovery establishes the fact that there is a coal field lying buried under the newer deposits of Southeastern England, and proves up to the hilt the truth of Godwin-Austen's hypothesis, after a lapse of thirty-five years.

Occurrence of Texas Lignites.—The lignites of Texas occur in the Fayette Beds and Timber Belt Beds of the Tertiary deposits. The borders of this area have been determined and have been fully described by Prof. E. T. Dumble in the Mineral Resources of the United States, 1887, since which time they have not been changed materially by the later investigations. The Fayette Beds underlie the coast clays and other Quaternary deposits of Texas. Their outcrops cross the entire State from the Sabine River to the Rio Grande, and consist of clays, sands, limestones, and pebble deposits. The underlying Timber Belt Beds are composed of siliceous sand and greensand marls, interstratified with clays, generally of a brown color, and thin beds of limestone. The beds of lignite contained in both these series of rocks are very numerous, sometimes occurring in lenticular masses, greater or less extent, thinning out in every direction, and again form extensive seams of considerable thickness, frequently fourteen feet. The Texas Tertiary has been but little disturbed. The force lifting these strata to their present level has caused a gradual and slow elevation, leaving them as originally laid down by the Tertiary sea. However, though no violent volcanic eruptions have distorted these beds, they are nevertheless found sometimes broken, faulted, and bent, caused by the drying and compression of loose, moist underlying deposits. (Second Ann. Rept. on the Iron Ore District of East Texas, 1890.)

The Geological and Natural History Survey of Minnesota.[1]—The report of the Geological and Natural History Survey of Minnesota for 1889 embodies a summary of American opinions on the older rocks of North America by Alexander Winchell, and the record of Mr. N. H. Winchell's field observations in the northeastern part of the state during 1888 and 1889. These observations confirm the views lately set forth by Irving, Bonney, and Samson, and the conclusions published by the reports of the Minnesota survey, to the effect that the Huronian system, as now defined and understood by the Canadian geological reports, really embraces two or three formations; that one of these is the true Huronian, as at first described and mapped by Murray, another is the Keewatin of Dr. A. C. Lawson, containing the iron ores at Tower, Minnesota, and another is the series of crystalline schists which have been styled Vermilion series. These three formations are distinctly separated by lithology and unconformities that have been noted from Vermont to Minnesota, and should no longer be

[1] The Eighteenth Annual Report of the Geol. and Nat. Hist. Surv. of Minnesota, for the year 1889; N. H. Winchell, director.

included under a single term,—at least not under the term Huronian, which at first had a correct and adequate definition, embracing but one of them.

This report gives an idea of the progress that is being made in the intricate geology of the northeastern part of the state, and of the economic resources that are being developed there.

Geological News—Archean.—Mr. Arthur Harvey thinks that the nodules found in the Animikie slates in the region of Thunder Bay are fossil organisms simpler in structure than sponges. In appearance they resembled the puff-balls of our meadows, varying in size from a hen's egg to a coal-scuttle. (Transactions Canadian Inst., March, 1891.)

Paleozoic.—A. Smith Woodward reports two new Devonian fishes, —*Onychodus arcticus*, from Spitzbergen (*Ann. and Mag. Nat. Hist.*, August, 1889), and *Climatius latispinosus*, from New Brunswick (*Geol. Mag.*, November, 1889).——Mr. R. B. Newton has described and figured a new mollusc (*Porcellia latidorsata*) from the Carboniferous limestone of Ireland (*Geol. Mag.*, 1891). Mr. Newton proposes to change the name of Porcellia Lev. to Leveillia, because it resembles the Porcellio of Latreille; an entirely inadmissable proposition.——E. N. Ringueberg has described and figured five new crinoids from the Lower Niagara limestone at Lockport, N. Y. *Callicrinus acanthinus*, *Glyplaster* (*Eucrinus*) *lockportensis*, *Ichthyocrinus conoidens*, *Eucalyptocrinus muralis*. (Annals N. Y. Acad. Sci., July, 1890.)

Mesozoic.—According to A. Smith Woodward, the so-called Creaceous lizard, Raphiosaurus, is founded upon the anterior half of the dentary bone of a characteristic Cretaceous fish, Pachyrhizodus. (*Ann. and Mag. Nat. Hist.*, November, 1889.)——Mr. David White has found Cretacic plants at several points about Gay's Head at Martha's Vineyard. They seem to be nearly related to those of the Middle Cretacic of Greenland, and there is reason to believe them identical with the flora of the Amboy clays. (Bull. Geol. Soc. Am., Vol. I., p. 554.)——Mr. R. T. Hill divides the Comanche series of Texas into several separate and distinct terranes, the lower two of which may possibly be of the pre-Cretaceous age. He gives both stratigraphic and paleontologic proof that such a division is neccessary. (Bull. Geol. Soc. Am., Vol. II. pp. 503–528.)——A new genus of Paleoniscid fishes from the Karoo formation of South Africa has been described by A. Smith Woodward under the name of *Atherstonia scutata*. In appearance of the scales, the situation and proportions of the fins, this

South African fish most nearly approaches Gyrolepis, from the European Trias and Rhætic, and Rhabdolepis, from the European Lower Permian. (*Ann. and Mag. Nat. Hist.*, September, 1889.)

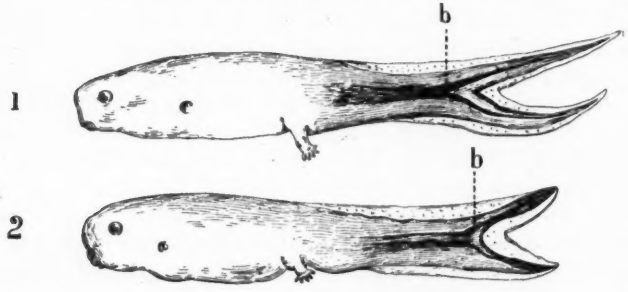
Cenozoic.—Mr. Sirodont has been studying the fauna of a Cenozoic formation at the foot of Mount Dol, on the southeastern side. He is of the opinion that the débris there accumulated belongs to a period anterior to the movement which elevated the shores of certain regions about the Baltic Sea. (*Revue Sci.*, June, 1891.)——Mr. E. Riviere reports the finding of the teeth and bones of *Equus caballus fossilis*, *Bos primigenius*, and a deer as yet undetermined, in the sands of Cergy. (*Revue Sci.*, May, 1891.)——Dr. Reusch has found glacial striæ and boulder clay in Finmark, belonging to a period much older than the "ice age." The ice-marked sandstones are probably Permian, but may belong to the Cambro-Silurian series. (*Geol. Mag.*, May, 1891.)

General.—M. L. Cayeux announces the discovery of an important formation of Diatoms in the tufa which contains *Cyprina planata* in the north of France and Belgium. This tufa results from the agglomeration of sands of the same horizon cemented together by a colloidal or chalcedonis silex. Among the Diatoms which are thus found in great numbers the author cites Synedra, Triceratium, and Coscinodiscus. (*Revue Sci.*, May, 1891.)——Mr. A. Lindenkohl reports a sunken river channel in Chesapeake Bay. A narrow and deep channel can be traced nearly throughout the entire length of the bay, from the mouth of Bush River to that of the Rappahannock, a distance of 120 miles. (*Am. Jour. Science*, June, 1891.)——On his return from Koukou-nor, while crossing the Nau-Chang, Mr. Martin discovered a large band of Jade encased in a rather friable rock. It is true Jade, as fine as that of Siberia, and is worked by the natives to make ornaments, often of great value, for the Chinese. (*Revue Sci.*, May, 1891.)——As to glacial records in the Newark system, Mr. I. C. Russell says that after personally examining nearly every area occupied by it, he fails to find any evidence to support the hypothesis that glaciers assisted in its deposition. (*Am. Journ. Science*, June, 1891.)

ZOOLOGY.

Abnormal Duplication of Urosome in Rana catesbiana.—While searching the stores where aquatic supplies are sold it has been my fortune to obtain two tadpole monstrosities,—one from a dealer in Harlem, and one from a store near Cooper Union, New York city. The occurrence of two such specimens during the same season, each obtained from a different locality, sets aside the probability of either being the result of accident. A careful examination has led to the conclusion that the malformations are congenital. As I am assured by Dr. John A. Ryder that nothing of the sort has been observed hitherto, I furnish herewith a description and sketch, as being of possible interest in their bearings on the morphology of monsters.

Both are tadpoles of *Rana catesbiana*, far enough advanced to possess the posterior limbs. These, however, have very small thighs, and pre-



sent a dwarfed appearance as compared with those of normal tadpoles of same size. One of the tadpoles died soon after coming into my possession; the other is alive. In both the abdomen is oval and flat, instead of swollen and globular. This characteristic has been persistent with the tadpole now alive, although it has been furnished with Anacharis, Utricularia, and other food-plants, and has fed upon them constantly with as much zest as is shown by ordinary tadpoles. In the tail of each a bifurcation takes place toward the tip, and there follows a duplication of the tail above and below the axis of the body. In both the dorsal and ventral branches of the fin-fold occurs a series of muscle-plates, and a dorsal and ventral branch of the chorda corresponding to the diverging limbs of the tail-tip. The plates extend a little beyond the point of bifurcation, and the notochord to the

extreme tip of each branch. In each three vein-like structures extend to the tips of branches, which I suppose to be the spinal cord, aorta, and caudal vein; but, as neither specimen has been dissected, and these structures are not very clearly defined, this point must rest in doubt.

The lines which cross near bifurcation appear to do so in each specimen, a dorsal branch of chorda passing into ventral, and a ventral branch into the dorsal fin-fold.

So far as known, all duplications of this kind have been to the right and left of a median line, as in Japanese goldfishes, and *this vertical duplication, with the result of appending to an ordinary tadpole a structure closely resembling the forked caudal fin of some fishes*, may suggest one of the methods of evolution of fishes and frogs from the same ancestral vertebrate form.

I should be pleased to correspond with any one interested, and to communicate further if other facts can be obtained by a closer examination of this exceedingly rare and unusual larval form.

[NOTE.—These cases of abnormal tadpoles described by Mr. Sherwood have seemed to me so remarkable that it appeared very desirable that they should be figured. The method of duplication of the tail is precisely the reverse of that observed in the case of the so-called "fan-tail" races or double-tailed goldfishes from Japan and China. What disturbances of ontogenetic processes may have led to the development of this singular form of monstrosity in the tails of tadpoles remains to made out. The origin of such irregularities may be coupled with actual mutilations, as seems to be indicated in other cases, by the experiment of cutting off the tails of tadpoles, as described in the *Archiv f. mik. Anatomie*, 1891 (D. Barfurth on functional adaptation and the regeneration of tissues in the Amphibia). In the memoir referred to it was found that the angle, with reference to the notochordal axis, at which the tip of the tail of a tadpole was cut off determined the direction of the inclination, upwards or downwards, of the tip of the tail, which was reproduced. If the tail was cut square across or at right angles, there was no departure from the normal form of the reproduced tip. If, however, the tip of a tadpole's tail was cut off so that the upper half of the plane of section, or that above the notochord, formed an acute angle with the latter (the angle opening forwards), the now newly reproduced tip of the tail would have its axis directed upwards. If the lower half of the plane of section formed an acute angle with the notochordal axis (the angle opening forwards), the tip of the tail which would now be reproduced

from the stump at the plane of section would be directed downwards instead of upwards, as before. In other words, the direction of the plane of section in these cases of the mutiliation of tadpole's tails determined the direction of the axis of the finally completed and restored tails.—J. A. R.]

Snakes in Banana Bunches.—Since the notices published on this subject in the NATURALIST (1890, Aug. and Oct., p. 968) three other instances have come under my notice. Prof. J. Lindahl, of Springfield, obtained from a fruit dealer in Chicago a specimen of the harmless dipsadine snake, *Sibon annulatum* Linn., which he obtained from a bunch of bananas. Wm. Cherrie, of San José, Costa Rica, informs me that as many as six men were killed during 1890 by the bites of a venomous snake which lives in the banana bunches, which they load on vessels at the port of Limon on the Caribbean Sea. From figures and descriptions Mr. Cherrie recognizes the species to be the *Telesuraspis schlegelii* Berth., which abounds in Costa Rica. It has the prehensile habit fully as well developed as in the Boidæ, which have been found in the like situation. The Philadelphia Zoological Garden has received a specimen of a small boa, the *Ungualia pardalis*, which was taken from a banana bunch from Jamaica. The list of banana-dwelling snakes now includes five species,—viz., three boas, one harmless colubrine snake, and one venomous species allied to the copperhead.—E. D. COPE.

Description of a New Jumping Mouse from Nova Scotia and New Brunswick.—But one species of Zapus has been recognized by recent writers on North American Mammalogy, hence it was with much interest that I examined three specimens taken at Restigouche, N. B., during the summer of 1880, by Mr. E. A. Bangs, of Boston, who recently sent me the skins for determination, saying that he had always considered them different from the animal found in Massachusetts. The mice were collected on the banks of a river in the depths of the forest, and were very difficult to procure, as they could not be induced to enter any kind of a trap, and it was necessary to shoot all the specimens taken. About half a dozen skins were obtained, all but three of which were subsequently destroyed by insects. These three specimens represent a species evidently distinct from *Zapus hudsonius*, and may be named and characterized as follows:

ZAPUS INSIGNIS, sp. nov.—*Meriones labradorius* Dawson, *Edinb. N. Phil. Journ.*, III., January, 1856, 2, not of Richardson and Sabine.

Sp. ch.—Size and color about as in *Zapus hudsonius*, from New

York and Massachusetts; tail slightly longer proportionally, white all around for about 25 mm. at tip. Length 225, tail 126, hind foot 30 mm. (Type ♀ ad.; No. $\frac{444}{887}$, collection of G. S. Miller, Jr., Restigouche, N. B.; September 10th, 1880; E. A. Bangs, collector.) The skull closely resembles that of *Z. hudsonius*, but is slightly larger, with brain-case a trifle broader and flatter.

The other two specimens are males. They agree perfectly with the type, except that the tails are longer, with the white tips reduced to 13 and 11.5 mm. They measure: Length 224, tail 141, hind foot 30.8; and length 235, tail 140, hind foot 30.4; and were taken at Restigouche, September 8th and 10th, respectively.

The three specimens agree in lacking the upper premolar usually usually found in *Zapus hudsonius*; but as all are old, and have the teeth much worn, it is possible that this tooth may have been shed, leaving no trace of its former presence. I can find no published account of the occasional absence of this premolar in *Z. hudsonius*; but Mr. F. W. True writes me that a single specimen from Pennsylvania in the U. S. National Museum shows this peculiarity.

Apparently the only description of a jumping mouse with white-tipped tail is that given by Dawson (*Edinb. N. Phil. Journ.*, III., 1856, 2), who describes the animal from near Halifax, and uses the name *Meriones labradorius* Rich. for it. Richardson took his name from Sabine (*Zool. App. Franklin's Journ.*, 1823, 661), whose specimen "from Cumberland House" was imperfect, having the tail only 2.50 inches long, thus rendering the name *labradorius* undeterminable. The first adequate description given under the name *labradorius* is that of Richardson, in the "Fauna Boreali-Americana," and this refers strictly to *Z. hudsonius*, or at least to a dark-tailed animal.

My warmest thanks are due Mr. Bangs for his kindness in permitting me to announce this new species, which is his discovery rather than my own.—GERRIT S. MILLER, JR., *Peterboro, N. Y., June 28th, 1891.*

Descriptions of Three New Species of Mexican Bats.—During a recent collecting trip, made for the Comision Geografica-Exploradora, to Las Vegas, Canton of Jalapa, Vera Cruz, I found what appears to be a new species of Vesperugo.

Close by the hamlet of Las Vegas is a small, long-since-extinct volcano, on the sides of which are found numerous "sink-holes" that give entrance into long, narrow caves or tunnels, through which formerly flowed the lava after it had ceased to be fluid on the surface. Some of these tunnels are as smooth and clean as though but lately emptied of their fiery contents, whilst others are strewn with great

heaps of angular fragments of lava, jarred down from the roof by some earthquake. Not infrequently two or three superimposed tunnels have been united in parts of their length by their respective floors having fallen through. In these caves, even on the hottest day, the air is fresh and cool, and has a perceptible current down the mountain side, which at the constrictions becomes a strong breeze. This coolness of the atmosphere was a fortunate circumstance for my collecting, as because of it I found most of the bats in a state of semi-hibernation, enabling me to take with the hand all those within arm's reach. Prof. J. A. Allen's recently described *Vespertilio velifer* was the prevailing species, abounding in hundreds, and of which I took with the aid of my assistant, Señor Carlos M. Teran, 193 specimens; 151 being males, and the remaining 42 females. This I take to be a fair average of the proportion of the sexes in what is probably one of their permanent headquarters. *Plecotus macrotis* was scattered about in very sparing numbers, but five specimens being seen. Unlike my former experience with this species in the valley of Mexico, all were found solitary, completely isolated from the other species as well as from one another.

While collecting these bats I came across one whose small size immediately distinguished it from the two other species; yet from its general similarity in form, viewed by the uncertain light of a stearine candle, and its almost exact identity in color with *velifer*, led me for the moment to suppose that it was a young of that species. But upon finding another of these small bats I made a closer examination, and at once saw that I had another species to deal with, new to me, and I fancied new to science. A search through all the literature of the subject that I have at hand confirms me in the belief that it is an undescribed species.

Six specimens, five males and one female, were taken, and no others were seen. In every case they were hanging from the sides of the caves, instead of from the roofs, as was the case with *velifer*, and unlike it were always solitary,—a point on which I place no special stress, as I find this and several other habits of bats to vary with locality, etc. Some were taken not far from the entrances, where, when the eyes were accustomed to the darkness, a faint sort of phosphorescent glow could be seen in the direction of the mouth of the cave. Others were taken many hundreds of yards within, where intervening abrupt angles rendered it absolutely impossible that the slightest ray of light could at any time of day penetrate. That this locality is not the headquarters of this species I am satisfied; whether higher up in the *tierra templada*, or below in *tierra caliente*, will prove to be its

center of distribution I am not positive; but I think that it will be in *tierra caliente*, at least during the winter months. The semi-hibernation of the specimens taken point toward this opinion, for I am inclined to believe that here, where ten miles of travel may bring an entire change of climate, the bats, as a rule, prefer to migrate rather than to hibernate.

These bats, when first taken, were entirely motionless; but in a few moments the heat of my hand revived them, whereupon they occasionally gave voice to a faint, high-pitched squeak,—so high in pitch that I fancy it lacked little of being beyond the range of the ordinary human ear. They went into none of those ecstasies of rage seen in many of the larger species that bite whatever comes within range of their mouth, be it their own foot or wing. One, found in a comparatively dry part of a cave, was completely beaded over with dew, indicating, I think, that it had passed at least several days since taking flight. When taken into the daylight they closed their eyes and covered them over with the carpal portion of their wings.

VESPERUGO VERÆCRUCIS, sp. nov.—All six specimens were indistinguishable one from another in point of color. The following color-description is taken from a dried skin, whereas all the rest of the description is taken from a specimen preserved in alcohol.

Fig. 1.

Fig. 2.

Fig. 3.

Vesperugo verœcrucis.

Hairs of back clove-brown for basal half, followed by two equal zones respectively broccoli-brown and clove-brown; some of hairs furthermore tipped with light Vandyke-brown, giving a decidedly "rusty" tone to the back. Ventral surface, bases of hairs slightly lighter than those of back, followed by light hair-brown, producing a grayish or smoky effect.

Wing membranes naked, except a very limited area on upper surface along sides of body, not exceeding three or four millimeters in width; and on lower surface, the area included between a line passing from

the middle of humerus to the knee and the side of the body is scantily haired.

Interfemoral membrane with a small, triangular patch of hair on its upper surface, covering base of tail, and extending to one-fourth of its length.

Legs and arms naked. Wing extending from base of outer toe. Antebranchial membrane losing itself at middle of radius. Two caudal vertebræ free from membrane.

Black glandular prominences between eyes and nostrils well developed, fringed with longish hairs on both upper and lower edges, and with three or four long, black, bristly hairs growing from its upper surface.

Inner edge of ear conch evenly convex. Outer edge coming up, in an even, sweeping curve, from angle of mouth to level of tip of tragus, where it meets a slightly concave line leading up to the obtusely rounded tip. A nearly semi-circular antitragus is developed from that part of the conch passing below the tragus. Bone of inner margin of tragus concave, thus throwing this organ forward, followed by a straight margin. Bone of outer margin with a sub-triangular lobe, followed by a deep notch, above which the greatest width is quickly reached. From here a nearly straight line leads to the tip, which is obtusely rounded. (See Fig. 2.)

Measurements in millimeters: Length of head and body, from tip of nose to base of tail, 37.5; length of tail, 36; length of tail beyond membrane, 3; length of head, 15; height of ear, from notch between antitragus and conch to tip, 10; height of tragus, inner margin, 4.5; height of tragus, outer margin, 6; greatest width of tragus, 2; length of antitragus, 2; height of antitragus (approximately), .75; length of forearm, 31; length of thumb, including claw and excluding metacarpus, 7.5. Second digit—metacarpal, 29. Third digit—metacarpal, 30.5; first phalanx, 11.5; second phalanx, 11; cartilaginous tip, 5. Fourth digit—metacarpal, 29; first phalanx, 10; second phalanx, 7; cartilaginous tip, 2.5. Fifth digit—metacarpal, 28; first phalanx, 8.5; second phalanx, 5; cartilaginous tip, 1. Interspace between tips of third and fourth digits, 16; interspace between tips of fourth and fifth digits, 37; interspace between tip of fifth digit and juncture of membrane with foot, 42; extent of outstretched wings, 212; length of tibia, 13.5; length of foot, 9; length of calcaneum, about 8.

Teeth $\frac{2-2}{3-3}\ \frac{1-1}{1-1}\ \frac{2-2}{2-2}\ \frac{3-3}{3-3} = 30$.

Middle upper incisors separated by 1.5 mm., inclined forwards and inwards; a large internal cusp on posterior-external edge halfway up

from base to tip. Outer incisors simple, conical, inclined parallel to their respective inner mates, separated from canines by about .75 mm. Lower incisors tri-lobate, evenly spaced. Upper canines long, simple, slightly recurved. Lower canines straight, with basal cusps on forward edge only. First upper premolar interior to tooth line, visible from the exterior. Second upper premolar longer than any of its corresponding molars.

A prominent conical excrescence is on the lower gum, opposite the space between the premolars, in front of which the point of the upper canine passes. Two much less prominent excrescences are on the upper gum immediately above this lower one. Type No. 527 ♂, Las Vegas, Vz., Feb. 19, 1891. Collectors, H. L. Ward and C. M. Teran.

Vesperugo veræcrucis appears to be most closely related to *V. georgianus;* therefore I append a comparative table of measurements:

	Tip of nose to tail.	Length of tail.	Length of forearm.	Length of tibia.	Length of third finger.	Expanse.	
V. veræcrucis.							
527. ♂	37.5	36.	31.	13.5	56.	212.	Alcoholic speciméns in the Museum of the Comision Geografico-Exploradora.
528. ♀	38.5	36.	32.	14.	55.	215.	
529. ♂	37.	34.	30.	13.	52.	210.	
530. ♂	34.	32.	30.	14.	51.	207.	
531. ♂	38.	34.5	30.5	13.5	54.	210.	
V. georgianus.							Extremes of measurements of ten alcoholic specimens of U. S. Natl. Mus., taken from H. Allen's Mon. N. A. Bats, p. 37, and reduced to millimeters.
Largest individual measurement,	46.	41.	36.	18.	61.	237.	
Smallest individual measurement,	41.	38.5	33.5	15.5	56.	219.	

From this table we see that, with but a single exception,—*i.e.*, third finger,—the smallest measurements given by Dr. Allen of *georgianus* exceed the largest measurements of *veræcrucis*. Were this the only difference found, I should probably consider my specimens as representing a smaller southern variety; but taken in consideration with difference of color pattern, the dorsal hairs having three and some even four distinct bands of color, instead of but two, as *georgianus* is described, the nakedness of the legs, less extent of hair on interfemoral membranes, etc., an apparent difference in the form of the ear, and slight differences in the teeth, lead me to also consider this difference in size as a characteristic of the species.

NYCTINOMUS DEPRESSUS, sp. nov.—For about a year I have been aware of the existence in this museum of an apparently undescribed species of Nyctinomus, an adult male taken within the museum building. I have vainly endeavored to obtain other specimens of this species, but

have so far found no other of the genus except *brasiliensis*, which is extremely numerous here, as well as in several other parts of the country where I have collected.

The specimen under consideration appears to be more closely allied to *N. macrotis* than to any other described species, but quite distinct from this, as will appear by a comparison of the figures and description here given with Dobson, Catl. Chiroptera in Brit. Mus., pp. 435, 436, Pl. XXII., Fig. 6.

Above, burnt umber; below, Prout's brown; bases of hairs on both surfaces, white. Membranes and ears, in the alcoholic specimen, nearly perfectly concolor with the under surface of body. A line of

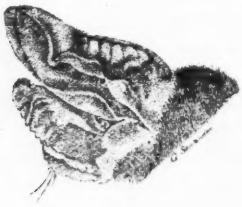


Fig. 4.

Fig. 5.

Nyctinomus depressus.

very short hairs bordering humerus and radius on upper surface of antebranchial membrane, so fine as scarcely to be perceptible when wet. On upper surface of wing membrane, short lines border the radius, except at the extreme elbow, and occupy the angle formed by the juncture of the fourth and fifth metacarpals. On both upper and lower surfaces the membrane is covered with hairs to a line extending from the proximal third of humerus to the middle of the femur. Interfemoral membrane covered for three or four millimeters below femora on upper surface, and naked on lower. Inner edge of ear evenly convex when flattened out, but from its vertical waviness appearing as in Fig. 5. The forward interior margin is reflexed over the deep depression at the upper extremity of the keel, thus forming a sort of pocket. Outer margin bilobate, the lower lobe arising from a short, straight base coming up from behind the antitragus, the upper lobe being continuous with the tip and inner edge. Keel large, strongly reflexed at angle near base, extending slightly exterior to the antitragus. Tragus straight on inner and upper margins. Outer margin formed by two slightly concave lines producing a slight lobe by their juncture at

the center of this margin. Conch with seven diagonally transverse flutings appearing as furrows on the upper and as ridges on the lower surface, the posterior one being very slightly marked. On the outer surface, passing through the centers of these flutings, and at right angles to them, is a slight ridge formed by a doubling of the skin. The peculiar depressed angle formed by the juncture of the two lobes of the external margin of the conch (*vide* Fig. 4) gives to the ears of this species a peculiar drooping appearance that has suggested to me *depressus* as a fitting specific name.

Nostrils circular, opening forwards, outwards, and very slightly downwards. A prominent subcircular swelling between the eye and nostril and slightly below a line connecting them. Side of face with five flutings extending to lip. A deep furrow under eye. Face and chin nearly naked. Wing membranes from inner surface of distal ends of tibia and from calcanea, indefinitely edged with yellowish-white, more defined in centers of interdigital spaces and in center of the space between the fifth finger and tibia. Outer edges of first and fifth toes closely fringed with short, curved white hairs; on the fifth toes, dorsal to this outer fringe, is a row of less numerous curved hairs, exceeding them about three times in length. From the upper surface of base of each claw spring three or four long curved hairs, about 8 mm. in length on chord. No gular pouch. Thumb with well-developed callosity at base of first phalanx.

Teeth $\frac{1-1}{2-2}\ \frac{2-2}{1-1}\ \frac{2-2}{2-2}\ \frac{3-3}{3-3} = 30$.

Upper incisors semi-conical, parallel, separated by space of 1 mm. Lower incisors bifid, crowded; the middle pair in a straight line, the outer ones starting from near centers of inner surfaces of middle pair and diverging at an angle of 45° from them. Canines long, with distinct, unbroken anguli, somewhat dilated on posterior-internal part of lower one, but not forming a true cusp. The upper canines are curved backwards, saber-shaped, passing 1.5 mm. below gums of lower teeth when the mouth is closed, the lower pair fitting into sockets between upper incisors and canines. First upper and lower premolars much smaller than second ones, in middle of spaces between these and canines. Second upper premolars decidedly longer than molars, with very acute outer cusps; the internal cusps not particularly developed, as is the case with *macrotis*.

Measurements in millimeters from alcoholic specimen: Length of head and body, from tip of nose to base of tail, 79; length of tail, 52; length of tail beyond interfemoral membrane, 33; length of

head, 31; length of ear, from notch between antitragus and conch to anterior point of margin, 25; length of antitragus, 7; height of antitragus, 4.5; height of tragus at inner border, 2.5; height of tragus at outer border, 4.5; width of tragus at top, 2.5; ears unite at base for 3.5; length of forearm, 60; length of thumb, not including metacarpal, 8. Second digit—metacarpal, 55. Third digit—metacarpal, 58; first phalanx, 24; second phalanx, 22; cartilaginous tip, 7. Fourth digit—metacarpal, 56; first phalanx, 21; second phalanx, 2. Fifth digit—metacarpal, 29; first phalanx, 20; second phalanx, 5. Interspace between tips of third and fourth digits, 31; interspace between tips of fourth and fifth digits, 60; interspace between tip of fifth finger and attachment of membrane to tibia, 60; extent of outstretched wings, 357; length of tibia, 18; length of foot, 13; length of calcaneum (poorly defined), about 16.

Type, and only specimen, No. 516 ♂ ad. Tacubaya, D. F., Mar., 1887. Collector, Louis G. Ruòz.

A comparison of the measurements of this species with *macrotis* shows that although the length of ear, forearm, and peculiarly short second phalanx of the fourth digit are the same in the two species, yet *depressus* is considerably the larger bat of the two.

CENTURIO MINOR, sp. nov.—I have in hand an adult female Centurio that I cannot identify with either *C. senex* or *m'murtrii*, because of some apparent differences in the cutaneous folds of the chin, and because of differences in measurements that I cannot believe to be due to individual variation. Unfortunately the collector commenced to make a skin of the specimen, dissecting the head to forward of the eyes, before deciding to preserve it in alcohol. For this reason I give only a figure of the lower jaw, for I know by experience that at best I could make but a guess at what was the original shape of the head. Fortunately the specimen has never been permitted to dry, so that the cutaneous folds and ears are in their normal condition.

Fig 6. *Centurio minor.*

The specimen contained a (about half-ripe) fœtus that is preserved entire, and that shows all the cutaneous folds of the adult, and besides possesses a curious cone of skin springing from the occiput, looking like the top-knot of hair of *macmurtrii* as figured in the Biologia Centrali-Americana.

Description of type, No. 525 female ad, Cerro de los Pajaros, Las Vegas, Vz., July or August, 1888. Collector Carlos M. Teran.

Color, above Brocolli-brown, lighter on occiput and neck, darker toward the tail. Each hair three-zoned; base brown, middle white,

and tip brown; the white occupying one-half of entire length. On the lower part of back the white becomes more and more soiled until it is scarely noticeable. Or the hairs may be described as brown on lower back, with slightly lighter centers that fade to pure white on neck, and occiput. Belly same as back, becoming lighter on head and neck, which is white, washed with brown. No distinct zones of color as on dorsal surface. At ventral aspect of junction of antebranchial membrane with the body is a small, triangular spot of white fur. Wing membrane externally covered with unicoled hairs, same shade as dorsum, to line from middle of humerus to near knee. Upper surface of interfemoral membrane thinly clothed, same color as rump. Wing membranes from tarsi. Antebranchial from bases of first phalanges of thumbs. Face naked, with the exception of a few white bristles and a row of short white hairs from corner of mouth to antitragi. Lower jaw naked in front, bordered by a fold of skin, free in central part that passes from antitragus to antitragus. Another narrower fold leaves this at corners of mouth extending across the line in a slightly curved line. In its center this fold is greatly widened (see Fig. 6), having a slight central depression or pit with a small one on each side of it. From this widened part of fold a straight sided, naked patch extends backwards having, a trifle below its center, a laneolate pit. Below on each side this naked space throws out an arm terminating in a rounded lobe. Lower down, and separated by a line of hair, are two warts, one on each side of central line, each with a slight depression in its center. The sketch will, I think, explain this more easily than words. The white hair bordering this inverted T-shaped, naked space is very short and fine, quite invisible to the naked eye when the specimen is wet. I have purposely greatly exaggerated its length in the sketch that it may not be overlooked.

Ears divided into two lobes of equal proportion, and form with those of *senex* as figured by Dobson in Catl. Chir. Brit. Mus. Facial cutaneous folds, and the peculiar markings between the fourth and fifth fingers, and internal to the fifth, are apparently the same. These markings are not exactly the same on each side, several of the lines being branched, tuning-fork shaped, and not conforming one side with the other. They, therefore, can probably be but little relied upon for diagnostic purposes.

Teeth $\frac{2-2}{2-2}\ \frac{1-1}{1-1}\ \frac{2-2}{2-5}\ \frac{2-2}{2-2} = 28$.

The only noticeable difference between the teeth of this specimen and those of *senex* (*vide* Dobson) is that in *minor* the second lower

molar is equal to the first instead of the half its size, and sectionally is quadrangular instead of triangular.

Comparative measurements of *minor* and *senex* in millimeters, those of latter species reduced from measurements in inches given by Dobson:

	C. minor.	*C. senex.*
Length of head and body	(about) 65	77
Length of head	20	25
Length of ear	13	17
Length [1] of tragus	4	7.5
Length of forearm	40.5	53
Length of thumb	13	13
Length of second finger, metacarpal	33	
Length of third finger:		
Metacarpal	37	38.5
First phalanx	14	17.5
Second phalanx	22	23
Third phalanx [2]	11	15.5
Length of fourth finger:		
Metacarpal	34	34
First phalanx	14.5	14
Second phalanx	13	14
Length of fifth finger:		
Metacarpal	36	35.5
First phalanx	14	15
Second phalanx	12.5	14
Interspace between tips of third and fourth fingers	32	
Interspace between tips of fourth and fifth fingers	45	
Interspace between tip of fifth finger and foot . .	52	
Extent of outstretched wings	277	
Length of tibia	17	17
Length of calcaneum	5.5	6.5
Length of foot	14	10

In three of these measurements,—*i.e.*, thumb, fourth metacarpal, and tibia,—the two species measure the same; in three others,—*i.e.*, first phalanx of fourth finger, fifth metacarpal, and foot, *minor* is the larger; in all the other thirteen comparative measurements it is the smaller. The difference in length of forearm, 12.5 mm., is much more than I

[1] This is greatest possible measurement,—*i. e.*, taken on extreme outer margin; that of inner margin is 2.5.

[2] This is the osseous phalanx; with cartilaginous tip it is 14.

have yet found in individual varieties of bats. That of the foot and of the ear, each 4 mm., is great for so short organs. The difference in tragus, 3.5 mm., particularly strikes the attention. I am inclined to believe that this is the least variable organ in bats.

Notwithstanding these differences the closeness of these two bats is very marked, and I should not be surprised if *minor* should eventually prove to be but a variety of *senex*. However, until there is positive evidence that such is the case, it is advisable to consider it as a separate species.

The collector failed to note the date of capture, but informs me that he is certain that it was in July or August, and probably in the former month. From this I imagine that the young bat would have been born some time in September. The specimen was taken at night while flying about a bonfire.—HENRY L. WARD, *Tacubaya, D. F., Mexico, April 20th, 1891.*

EMBRYOLOGY.[1]

Some Notes on the Breeding Habits and Embryology of Frogs.—The following notes are the outcome of several years of observations on the breeding habits and stages in the development of frogs. They are confessedly very incomplete, having been collected rather as an amusement than with any desire to increase our present knowledge of amphibian embryology. Some older observations have been verified, and I believe a few new observations made which perhaps are worth recording. From many points of view I think the development of the frog is better adapted to the need of students beginning the study of embryology than the classical chick. Certainly this seems to be true if a clearer knowledge of the phenomena of development in general is desired, and not merely an introduction to human embryology,—the best excuse offered for presenting the hen's egg and chick, with its mystifying yolk and white and its incomprehensible (to the beginner) larval membranes. On the other hand, the ease with which the young chicks are to be obtained at all seasons makes a very strong argument in their favor. Correspondingly, the difficulties of removing the younger stages of the frog's egg from the surrounding jelly has been a great drawback to its study. Appreciating this last difficulty, I have experimented for several years on methods of removing these

[1] Edited by Dr. T. H. Morgan, Johns Hopkins University, Baltimore, Md.

jelly membranes. At last I think that I have successfully solved the problem, and can now obtain with the greatest ease the most difficult stages, which are also in perfect histological condition. The method will be given in the last section—9. Clay models of the early stages of segmentation of the egg have been a very useful addition in presenting to others the arrangement of the cells. These, of course, should be copied from actual eggs, and not from the perfectly regular (but entirely schematic) figures of the ordinary text-books.

The following topics are touched upon: (1) Time of Laying, and Localities. (2) Laying in Confinement. (3) Polar Bodies. (4) Segmentation of the Eggs. (5) Orientation of the Egg. (6) Enclosure of the Light Pole by the Dark Pole. (7) Effect of Temperature. (8) Times of Hatching, etc. (9) Methods of Technique.

1. *Time of Laying, and Localities.*—The observations were made in the vicinity of Baltimore, Md., during the spring months of the years '88, '89, '90, '91. I shall only speak of those species of whose identity I am certain. Other and more imperfect observations are left out. The first frogs to lay, and amongst the very first (*Acris gryllus* excepted) to appear, are the wood frogs (*Rana sylvatica*). A few warm days in early spring suffice to bring them out. The following records give a general idea as to the time: February 23d, '91, and March 8th, 9th, and 10th, '80. The eggs of these had been laid several days. The egg-bunches are found in small pools on the edges of woods, generally amongst the low hills, and are often stuck to twigs of bushes. The bunches are generally large, four to six inches in diameter, and contain very many good-sized eggs. In the same pools it is quite usual to find the firmer egg-bunches of Amblystoma, as this Urodele also lays its eggs very early.

Somewhat later two species of tree frogs appear in the small pools in the woods, generally in quite small, and therefore, during the daytime, often quite warm, puddles; sometimes in the same pools as the wood frogs, oftener in the ditches by the side of the road. These tree frogs are *Hyla pickeringii* and *Chorophilus triseriatus*. They are often found paired, and may be in this condition carried to the laboratory, where they continue to lay for hours without abatement. The eggs of these species are very similar, and I know no certain method of distinguishing the one from the other. The bunches are small, attached to bits of grass, or lie simply on the bottom, and each bunch contains from five or six to fifteen or twenty eggs. I have the following records of times at which the eggs were found: Hyla—March 9th, 10th, 13th, April 5th, '90; Chorophilus—February 23d, '91, March 13th and 24th, '90.

The eggs of *Rana halecina* are found still later, sometimes in the same localities as the wood frogs, oftener in pools in the open ground quite away from the woods. The eggs are individually smaller, so that although the jelly masses are often as large as those of the wood frogs, the number of eggs is greater. The following are the records: March 25th, April 5th, '90. The eggs of *Rana clamitans* are not so certainly referred to its adult, and I have only strong probability showing them to belong to that species. The bunches much resemble those of *R. halecina*, but the eggs are larger and the jelly firmer. Those I have found were also attached to twigs of bushes, which is not always the case in *R. halecina*.

The toad (*Bufo lentiginosus*) in this latitude lays very late in the spring. The eggs are easily distinguished from the frog's, as they are laid in long strings, often yards in length, the eggs arranged (generally) in a single row. They were recorded April 14th, '90, April 5th and 6th, '91. The best localities seem to be those parts of rivers or streams where the water backs up, and to one side protected by a bar, so that the eggs are not carried away by the water, and where the water itself is often exceedingly warm. Copulating individuals are easily obtained, and they continue to lay in confinement.

2. *Laying in Confinement.*—If frogs are caught at the height of the breeding season, they can often be got to lay in confinement. The surest way is to get the paired individuals, frightening them as little as possible, and placing them in dishes or aquaria containing the requisite amount of water. Only once have I had the wood frogs lay in the laboratory, although with proper precaution there seem to be on very great difficulties of obtaining in this way the eggs of this species. A single large bunch of eggs were laid by this pair during the night, which developed normally.

By far the best and easiest eggs to be obtained by bringing frogs into the laboratory are those of the tree frogs named above. They will continue to lay small bunches of eggs for as much as twenty-four hours after catching them. By removing the bunches as fast as laid, an exact record may be kept as to the age of the different lots. Moreover, the eggs of these species are small and the jelly clear, so that they are well adapted for study of the segmentation stages under the microscope. The distinction between the cells derived from the black (animal) pole and those from the yellow (vegetative) pole is very sharp, and the fate of the cells more easily traced through the later stages of segmentation. Toads brought into the laboratory and placed under proper conditions continue to lay for many hours. A single

copulating pair, which were laying eggs when captured, were isolated *over night* from other individuals, and in the morning a long string of eggs were found. Dr. E. A. Andrews carefully estimated the number of these, and found that inside of ten hours the female had laid the astonishing number of 28,000 eggs, and the male had fertilized them. This was at the rate of forty-one eggs per minute for ten hours. After the eggs are laid the male and female separate, and while formerly they remained quietly in the dishes or aquaria, they now proceed to climb out, and show a tendency to wander over the building.

3. *Polar Bodies.*—I have seen these extruded in the egg of the tree frog. They are found at or near the apex of the black pole, and appear as two white spots with a black periphery. Sometimes they are quite near to each other. Again, I have seen them separated by quite a wide distance. They were extruded about one hour after the eggs were laid as nearly as could be calculated.

4. *Segmentation of the Eggs.*—The series of diagrams ordinarily found in text-books on embryology are exceedingly diagrammatic, and give an entirely erroneous impression as to the appearance of the segmenting egg, especially during the later stages. I found this to be the case in the eggs of the tree frogs (see above) and the common toad, and expected to find a parallel case in *Rana temporaria*,—that studied by Ecker, and from whom the text-book figures are taken. During the present spring ('91) I have procured the early stages of segmentation of this frog, and found it to agree in every particular with other species, and therefore to depart from the text-book or classical type. Rauber has given excellent figures of the later stages of the frog eggs, and in many points I have verified his account. The first furrow divides the egg into two equal halves. The second at right angles to this gives four equal segments. The third furrow is not equatorial, but lies nearest the dark pole of the egg, the result being in four equal black cells and four larger, but equal, light cells. At the next stage the marked regularity of the preceding stages is lost, and each of the eight cells divides, as it were, independently of the rest. The text-book figure at this sixteen-celled stage may be taken to represent an ideal to which the egg never attains. The division of the sixteen cells into thirty-two does not conform to any rule, although again, but in a less degree, Ecker's figures may be taken to represent in the most diagrammatic way possible the planes of cleavage. Without figures it is impossible to describe the precise method of segmentation; those of Rauber approximate, I believe, most nearly to the truth. In general, we may

say that up to the eight-celled stage the segmentation is very regular, but that after that no particular plane of division can be prophesied for any segment. Often during the sixteen-celled stage the upper eight (black) cells are arranged in almost a perfect bilateral symmetry, and not a radial one, as given by Ecker.

5. *Orientation of the Egg.*—The relation of the first plane of segmentation to the adult has attracted a great deal of interest during recent years. The relation found in the frog's egg has been already studied, with varying results. Newport's experiments in 1851, '53, '54, are, I think, the most to be relied upon, and during the present spring I have had the pleasure of verifying his results on a small scale. The eggs of the tree frog were used in the experiment. The outer layers of the jelly were removed from an egg which had not yet divided or had only undergone the first cleavage. A small, triangular piece of card-board was then cut out, and a drop of collodion placed on it. The egg with its thin layer of surrounding jelly was placed on the drop of collodion as soon as the latter began to stiffen, and card-board and egg were then immersed in a dish of water. With a pencil a line was drawn on the card-board corresponding to the plane of first division. The water was changed several times until all trace of ether was gone, and afterward set aside in a quiet and warm place. Several other eggs were prepared by the same process. At the end of forty-eight hours the medullary folds began to appear, and it was then seen that the plane between these corresponded exactly, in most cases, to the plane indicated on the card-board, and therefore the obvious conclusion is drawn that the first plane of division divides the egg into two parts, corresponding to the right and left halves of the adult body. In a few eggs the first plane was somewhat to the right or left of the mid-line of the adult. The embryo begins to rotate in the egg-capsule very soon after the appearance of the medullary folds, so that unless observations are made at the very first appearance of the folds the results will be falsified, on account of the rotation of the embryo from its original position. The eggs of the tree frogs are especially good for experiments such as these, on account of the rapidity with which they develop, decreasing therefore the possibilities of a secondary change in position of the egg after it has come to rest and it plane of division marked. I think it would be possible, by keeping the eggs in a warm room, to cause them to develop the medullary folds within twenty-four hours after the eggs are laid.

6. *Enclosure of the Light Pole by the Dark Pole.*—In studying a series of eggs from the segmentation period to the formation

of the blastopore, the so-called overgrowth or epibolic growth of the black cells has been observed. I am quite sure, however (except in the immediate region on the dorsal side of the blastopore, and later over its whole extent), that the yellow cells disappear from the surface not by an overgrowth of the first-formed black cells, *but by a process of splitting off of cells from the upper corner of the yellow cells themselves.* In other words, there is not a general migration of black cells, but each remains approximately in the position in which it was first formed, and new black cells are continually added at the periphery of the black cap by the splitting off of cells from the upper ends of the yellow cells, so that Balfour's sentence, that the disappearance of the yellow cells "is effected by the epiblast growing over the yolk at all points of its circumference," is somewhat misleading. As a corollary to what I have said, it follows, of course, that there is a continuous formation of new pigment taking place at the periphery of the black area *within the new cells that are being formed, and also within the ends of the yellow cells which go to form the new cells in this region.* I have not studied with sufficient care the gradual turning in of the cells around the rim of the blastopore. In one living egg, however, I saw in the dorsal region of the blastopore some of the cells forming the floor of the archenteron gradually disappear *within* the blastopore.

7. *Effect of Temperature.*—It is impossible to give any exact time to the different stages of development, as the time is directly proportional to the temperature of the water within certain limits. The highest temperature is not always the optimum, for several bunches placed in an incubator for hen's eggs were entirely destroyed. The freezing of the water in which the eggs are kept does not seem to injure the eggs in the least, but simply to retard their development. I have had eggs completely surrounded by ice, and afterward development quite normally. However, when the eggs themselves are actually frozen they seem to be destroyed, perhaps by the formation of ice spicules within them. The wood frogs, which lay their eggs so early, generally lose in this locality great numbers of them on account of getting caught in the ice. Those which are not so caught develop later, when the ice melts, and do not seem, in any way, to be injured by water at the freezing-point. I think there is here a most interesting field for experimentation by the physiological embryologist, and I regret I have not kept exact records of the effects of heat and cold.

8. *Times of Hatching, etc.*—The different species of frogs leave the jelly membrane at different ages. Some have the tail well developed, and are quite active. Others have the tail just appearing, and are

only able to twist their bodies slowly from side to side, as they cling to the jelly-mass by means of the suckers below the mouth.

The young tadpoles of the wood frog leave the water as small frogs in the late spring of the same year in which they were laid,—that is, become frogs in four to six months. Eggs collected about March 17th began to change to frogs about June 1st to 14th. These were kept in quite cool water, in a basement room, away from the sunlight.

At the time of transformation into tadpoles *a sudden decrease in the length of the intestine is brought about.* The tadpoles cease to eat, and the intestine is entirely freed from extraneous matter during this time. The change takes place at the same time that the tail is absorbed within the body (not dropped off, as popularly supposed), and at the same time the pair of fore feet, which were enclosed within the branchial fold, break through to the exterior. The intestines were removed and measured from the pyloric end of the stomach to the proximal end of the rectum. Their lengths are recorded in the accompanying table for the wood frog:

(*a*) From a large tadpole, with whole tail and two large posterior feet. (*b*) From a tadpole, with whole tail and two large posterior feet. (*c*) From a tadpole, with whole tail and two large posterior feet. (*d*) From a young frog, tail beginning to disappear, and four feet. (*e*) From a young frog, ⅛ tail and four feet. (*f*) From a young frog, ½ tail and four feet. (*g*) From a young frog, no tail, and out of water two weeks.

9. *Methods of Technique.*—The eggs during the periods, in which it is difficult or impossible to remove the inner jelly membrane, can

be freed in the following manner: With a pair of sharp scissors each egg must be cut out from the general jelly-mass, retaining as small an amount of surrounding jelly as possible. It is then put into an alcoholic solution of picric acid for an hour or longer (one to twelve). The solution is prepared by saturating 35 per cent. alcohol with picric acid, and adding the same amount of sulphuric as in Kleinenberg's solution. The solution is not diluted, but used saturated with picric acid. The eggs are then washed for several hours in 35 per cent. alcohol, several hours in 50 per cent. alcohol, and placed in 70 per cent. for several days, changing the alcohol once or twice if necessary. About the second day the inner membrane begins to swell, due to a slow osmotic action, I think, as the membrane is stretched by tension from within. On the third or fourth day the swollen membrane may be pierced by a sharp needle, and the egg taken out, which is then placed permanently in 80 per cent. alcohol. The method is exceedingly simple, and consists largely in waiting a few days for the osmotic action to take place. Such eggs, if properly prepared, are in excellent histological condition. This simple method has proved so successful that I have not further experimented with it. It is possible that it may be improved by varying the strength of alcohol used, but I have not seen the need of looking further. The membrane does not swell in stronger alcohol than 70 per cent., and weaker would macerate the eggs.

Certain precautions are necessary in imbedding the eggs to prevent brittleness. This is obviated by soaking the eggs before imbedding, for several hours, in a solution of turpentine saturated with paraffine, and kept in a warm place,—not so hot as the water-bath (50° C.). Heat causes the egg to become brittle. This is obviated by the above process of soaking, so that the egg need not remain so long as an hour in the melted paraffine of the water-bath. In the younger stages there is no need for very thin sections, but sections 10 μ thick are sufficent for all purposes. If the sections are cut too thin the yolk tends to break up and crumble.—T. H. MORGAN, *May 1st, 1891.*

ENTOMOLOGY.[1]

The White Wax Insect.—The following account of the production and use of the white wax of China, about which very little is known in America will be read with interest. We find it in the issue of the N. C. and S. C. and C. *Gazette* for March 26th, 1891.

The native candles of the north are made of sheep's tallow, but those of the central provinces are partly manufactured from bean oil, which is able to be utilized for this purpose by the addition of white insect wax in the proportion of about one-eighth. Where bean oil cannot easily be procured the seeds of *Stillingia sebifera* are employed. This tree grows most extensively in the south. A picul of its seeds yields twenty or thirty catties of tallow, and when this has been pressed out, subsequent grinding and steaming result in the production of an oil called *ch'ing yu* out of the albumen. Insect-made white wax is added in the proportion of three catties to a hundred catties of the tallow. It is the wax which gives it sufficient consistency to remain thoroughly congealed in ordinary temperatures. From Hankow in 1889 about 120,000 piculs of the tallow of the tallow tree were exported, and of this quantity nearly half found its way to Shanghai in the same year. An enormous quantity of candles are made in Shanghai and its vicinity, and the pressing out of bean oil for the manufacture employs a large number of water buffaloes. The old industry is that which has for many ages made use of the tallow-tree product. The new has grown out of the Newchwang trade which supplies Shanghai with beans. The vast industry which is an essential to the use of the vegetable tallow began, we are told, about six centuries ago. Till recently we knew generally that the wax is made at Luchou Fu, in Anhui, at Kiahing in Chêkiang, at Hinghua Fu in Fukien, as well as in Hunan, in Kweichou, in Yunnan and Szechuan. But the processes were never fully described, and there was a need for fuller information. That want has been supplied by the inquiries of Mr. Alexander Hosie, of the British consular service in Szechuan. The tree on which the insects produce the wax is an inhabitant of a different part of the country from that which produces the insects. Chinese ingenuity brings the insects from their birthplace to their new home many miles away, and sets them to the work of wax-making. It is this curious history which Mr. Hosie has been the first thoroughly to investigate.

[1] Edited by Prof. C. M. Weed, Hanover, N. H.

The white wax insect was frequently referred to in old works on China. One object of Mr. Hosie's recent journey to the Chienchang valley near Mount Omi was to procure from the tree on which the insect live specimens of the foliage and flowers, for Sir Joseph Hooker. These he procured, and specimens of the living tree with the incrusted white wax on it, as well as samples of the latter, as it appears in commerce, and of the Chinese candles made from it. The said valley is 5,000 feet above the level of the sea, and is the great breeding ground of the insect. The tree is an evergreen, with the leaves springing in pairs from the branches, very thick, dark green, glossy, ovate, and pointed. In May and June it bears clusters of white flowers, succeeded by fruit of a dark purple color. The Kew authorities now say it is the *Ligustrum lucidum*, or large-leaved privet. In March Mr. Hosie saw on the trees certain brown pea-shaped excrescences attached to the bark of the boughs and twigs. Opening some larger ones they presented either a whitey brown pulpy mass, or a crowd of minute insects looking like flour. Their movements were just perceptible to the naked eye. From two or three months later they become brown creatures, with six legs and a pair of antennæ. These are the white-wax insect or *Coccus pela*. There is a beetle which is a parasite on the Coccus. It is a species of Brachytarsus. It is found in many of the excrescences above mentioned, and burrows in the inner lining of the scale, which seems to be its food. When a scale is plucked from the tree the Cocci escape by the hole which is made. It is in the town of Kiating that insect white wax is produced. This city is 200 miles to the northeast of the Chienchang valley. The scales are gathered in the valley, and made up into paper packets of about sixteen ounces each. Sixty of such packets make a load, and they are conveyed by porters from the valley to Kiating in the night-time. If carried by day the insects would develop and escape from the scales. As it is, an ounce is lost in transit. A pound of scales in good years is sold for half a crown. In bad years it is worth twice this amount. In favorable years a pound of scales produces four or five pounds of wax. In the plain around Kiating very many plots of ground are seen edged with stumps, from three or four to twelve feet high, with numerous sprouts growing from their gnarled heads, as on pollard willows in our own country. The tree is probably *Fraxinus chinensis*,—a kind of ash. The leaves spring in pairs from the branches, and are light green, ovate, pointed, serrated, and deciduous. On the arrival of the scales in May they are made up in small packets of from twenty to thirty scales, which are enclosed in a leaf of the wood oil tree. Rice straw

is used to suspend the packet under the branches of the ash or white-wax tree. Rough holes are drilled in the leaf with a blunt needle, so that the insects may find their way to the branches through the openings. The insects creep rapidly up to the leaves, where they nestle for thirteen days. They then descend to the branches and twigs, and take up a position on them. The females then begin to develop scales on which to deposit their eggs, and the males to excrete the substance known as white wax. It first appears as an undercoating on the side of the boughs and twigs, looking like snow. It spreads gradually, till in three months it is a quarter of an inch thick. In a hundred days the deposit is complete, and the branches are lopped off. The wax is removed chiefly by hand, and is placed in an iron pot of boiling water. The wax, on rising to the surface, is skimmed off, and deposited in a round mould. This is the white wax of commerce. It is used to coat the exterior of animal and vegetable tallow candles, and to give greater consistency to the tallow. It is also used to size paper and cotton goods, to impart a gloss to silk, and as a furniture polish. From Hankow each year at present about 15,000 piculs of white insect wax are exported in a year, and the main portion of it finds its way to that port from Szechuan. Chinkiang absorbs 1,000 piculs, and Shanghai 14,000 piculs. At Shanghai one-half is for home use, and the other half to distribute again to other ports. Tientsin requires 1,000 piculs, and Canton and Swatow a thousand piculs each. Thus it appears that while Szechuan is not the only producing center of insect white wax, it produces enough to furnish the most distant cities with the means to make a sufficient number of candles to maintain the temple worship, as well as to enable the people everywhere to equip their lanterns for walking in the evening, and aid in night illumination generally.

Recent Station Bulletins.—Mr. James Fletcher, of the Central Experimental Farm of Canada, has recently issued an admirable popular bulletin (No. 11) concerning injurious insects and insecticides. The Delaware Station issues as Bulletin No. XII. a somewhat similar account of certain noxious species, together with a record of experiments with remedies. Prof. C. P. Gillette issues as Bulletin No. 15 of the Colorado Station timely articles concerning the Codling Moth and Grapevine Leaf-Hopper. Mr. H. E. Weed, of the Mississippi Station, publishes as Bulletin No. 4 a pamphlet of forty pages, in which he discusses the following topics: The Screw Worm, Pea Weevil, Bean Weevil, Striped Cucumber Beetle, Ox Warble Fly, Plum Curculio, Codling Moth, Insecticides, and Spraying Machinery.

Food Habits of Coccinella convergens.—Since the publication of Prof. Forbes's paper upon "The Food Relations of the Carabidæ and Coccinellidæ" various obververs have found that at least one species (*Megilla maculata*) of the family Coccinellidæ is a vegetable feeder.

I have noticed another species, *Coccinella convergens*, doing considerable damage to cabbage plants this season. The first noticed cabbage thus eaten was sprayed with Paris green, and upon examination the day following several dead specimens of *C. convergens* were found on the ground under the plant. Since then I have noticed others eating the leaves of several cabbage plants.—*Howard Evarts Weed, Mississippi Agricultural College.*

Transformations of Coleoptera.—Mr. Wm. Beutenmüller, of the American Museum of Natural History, has lately published in the Journal of the New York Microscopical Society (Vol. VII., pp. 1–52), a Bibliographical Catalogue of the Described Transformations of North American Coleoptera, for which he deserves the thanks of his entomological brethren. In arrangement and style it is similar to Mr. Henry Edward's catalogue of Lepidoptera. Three hundred and ninety-six species are included in the list,—a striking commentary upon the paucity of our knowledge of the immature stages of this great order.

ARCHEOLOGY AND ETHNOLOGY.[1]

The International Congress of Anthropology and Prehistoric Archeology of Paris, 1889.—(*Continued from page 679*).

Sixth Question: "Firstly, The Human Remains of the Quaternary Epoch Discovered Within the last Fifteen Years; and secondly, The Proper Ethnic Elements Belonging to the Men of the Different Ages of Stone, Bronze, and Iron."

The discussion of this question was opened by Monsieur Fraipont, of the University of Leige, Belgium, who had been the discoverer of the celebrated cavern of Spy, on the river Meuse, in Southern Belgium. He exhibited the skulls and bones which he had there found, and said that these were the most complete representatives now known of the race of Canstadt, as has been classified by MM. de Quatrefages and Hamy. This man was contemporaneous with the mammoth

[1] Edited by Dr. Thomas Wilson, Smithsonian Institution, Washington, D. C.

and the *Rhinoceros tichorinus*, but was subsequent to and not contemporaneous with the *Rhinoceros merkii* and the *Elephas antiquus*. Monsieur Fraipont enumerated the pithecoid characters found in the skeletons of Spy, and concluded that there was "an ascending evolution, the most characteristic of humanity" during the Quaternary Period.

Monsieur de Quatrefages reserved his opinion upon the characters named by Monsieur Fraipont as simian or pithecoid.

Dr. Topinard was doubtful if the facial portion of the skull of the man of Spy was correct, and in consequence thereof the osteology of the face must rest doubtful.

Monsieur Manouvrier admitted the general resemblance of the men of Spy with those grouped around the skull of Neanderthal, but explained some of their diversities. He investigated the morphology of the femur and tibia of the men of Spy, and interpreted it differently from Mr. Fraipont.

Dr. Deniker could not agree with M. Fraipont in the simian characters which he found in the man of Spy. Dr. Topinard stated also, on the side of Dr. Deniker, that the incurvation of the tibia existing among the gorillas is not found among the orangs.

M. Fraipont explained his meaning of the terms simian and pithecoid, so that they did not appear so strong as he had at first stated.

Dr. Hamy said that the discovery made by M. Fraipont at the cavern of Spy gave proof of the existence near the middle of the Quaternary period of the existence of a special human race. His discoveries had rehabilitated the skull of Neanderthal, and completed the passage between the exaggerated type of that race and the specimens less accentuated of Brux of Canstadt and of Engisheim, and permits us to utilize the most precious pieces known, now nearly forgotten, the debris of the skeleton of Lahr. Dr. Hamy recounted the circumstances in which Ami Boue discovered the skeleton of Lahr in 1823, of their translation to the museum, and that they had finished by taking their legitimate place by the side of the remains from Neanderthal and de la Naulette. He described rapidly the bones of each member, the fragments, etc., going on from head to foot, and showed the analogies which these pieces presented with those of Spy, and demonstrated by these comparisons that the skeleton of Lahr was indeed contemporaneous with the Lehm from which it had been extracted, and it was now, by reason of the discovery of Spy, to be classed among the human remains of the race of Canstadt.

Dr. Hamy, continuing the discussion of Question Sixth of the program, reviewed the new documents on the subject of the archeology of the primitive human race since the publication of his great work on the Crania Ethnica. The fragments found in the Grotte de Gourdan, which had been recently published, the under jaw from the Grotte of Malarnaud, found by M. Regnault, and described by M. Filhol, and which M. Hamy had presented,—these are, along with the bones of the men of Spy, the only new acquisitions of the race of Constadt.

The race of Cro-Magnon is represented by several new discoveries, of which the most important was the discovery of the skull in the Grotte du Placard, which had been exhumed by M. Maret.

Dr. Hamy described this piece, and assigned it a place in the anatomic series of the race of Cro-Magnon. We possess, said he, no new document or specimen of the types of Furfooz, the second type of which appears more and more to attach itself to the age of polished stone, which furnishes from one time to another in Southern Belgium new specimens, more or less characterized as belonging to this ethnic group.

Monsieur Felix Regnault sent a human lower jaw, incomplete, found in the Grotte of Malarnaud, in Ariege. Dr. Hamy declared it to have great affinity with the similar pieces from Naulette, Goyet, etc., and other caverns in Belgium.

Monsieur Marcellin Boule described the caverns of Malarnaud from which this under jaw came, and presented to the congress his written notes thereon. A section of the earth of the cavern and the place where this jaw was found was thus composed: 1st, the superficial rubbish; 2d, the deposit of clay and gravel containing the remains of divers animals of prehistoric times,—the auroch, the reindeer, the mountain goat, etc; 3d, a strata of stalagmite; 4th, clay and gravel, —in this were the cave bear and lion, the wolf, mammoth, etc., and it was from this strata that the under jaw came. This is the stratum of the machoire de la Naulette, the skeletons of Spy, the skull of Engisheim, and probably that of Neanderthal. There were no specimens of *Elephas antiquus*, *Rhinoceros merkii*, or hippopotamus, or the animals characteristic of the early Quaternary period, and which correspond to the human industry of Saint-Acheul and Chelles, and therefore, said Monsieur Boule, the Quaternary prehistoric man,—he of the Chelleen epoch,—remained still unknown.

Dr. Lagneau gave it as his opinion that this under jaw of Malarnaud belonged to the race of Canstadt or of Neanderthal, and he spoke of

the great extension of territory which this man covered in prehistoric times.

M. de Quatrefages presented a manuscript of M. Hardy, of Perigueux, which was entitled, "The Discovery of a Sepulchre of the Quaternary Period of Chancelade in Dordogne," and gave several observations upon the skull of which Hardy has presented the photograph. The skull was dolichocephalic, but asymetric; the face large, the orbits of elongated form; the front was well developed, the femurs were columnar, the tibias platycnemic, and it altogether presented the most striking and apparent characteristic of the race of Cro-Magnon.

M. Manouvrier read a communication on the platymetry or flattening of the ahtero-posterieur of the upper third of the diaphyse of the femur, that he had often observed upon human femurs in the neolithic period.

M. Goldstein presented his pantometre, and explained its use and necessity in anthropological photographs.

Dr. Verrier presented two Australian skulls.

Dr. Soren Hansen presented his paper on prehistoric trepanning.

Dr. Benedickt explained his method and apparatus on crainometry, and referred to his display at the exposition.

Dr. Jacques presented the human remains gathered by the brothers Siret in Spain. These brothers Siret were civil engineers in Antwerp, and I had the privilege and the pleasure of visiting and studying their collection while in that city. Their excavations were conducted principally in Southeastern Spain, in the country between Carthagene and Almeria. We have their magnificent and extensive volume, costing $100, in our library. Their investigations were regular, methodical, and scientific. The prehistoric epoch to which these investigations belonged were principally the neolithic period and the age of bronze.

Dr. Jacques had studied seventy of these skulls and skeletons, the former complete, the latter more or less so, and gave his opinion as to the divisions to be made as to the races to which they belonged. One race, the most common, presented many analogies with that of Cro-Magnon, but with an occasional characteristic of the type of Furfooz. The race of Furfooz was there shown by some specimens, though not so frequent as the former. A third group identified by Dr. Jacques compared with those of the Basques, and his conclusion was that the neolithic people southeast of Spain comprised individuals belonging to the most ancient epoch in the Iberian peninsula.

Dr. Topinard delivered a most interesting address, entitled "Paleo-

anthropology." He said the congress was interested in prehistoric anthropology as in prehistoric archeology. There was a paleo-anthropology as a paleoethnography. The former required the services of a naturalist and anatomist; the latter required the ethnographer and the archeologist. The excavator serves to unite the two former, as the traveler serves to unite the two latter. It is because of, or by means of, this link that the work of the one is rendered beneficial to and aids the other. It is exceedingly rare that the anatomist is an explorer. For every one competent archeologist there are hundred amateur excavators. The latter interest themselves bu slightly over the human remains. Museums and private collections are gorged with industrial and artistic objects of prehistoric man, but are almost entirely without any of his remains. He lamented these gaps in the means of our information, and was much impressed with our poverty in this regard when he came to make an inventory of our knowledge concerning the ancient races of man. He declared the necessity of having numerous series in order to study with success the craniology, and entered into the details of methods employed in order to find the necessary facts, and gave a résumé of our knowledge concerning our prehistoric ancestors. Then followed his remedy. He proposed that the congress should take the initiative in preparing detailed instructions for the usage of excavators, in which, said he, they can be made to understand that the work on which they are engaged is indefinitely more difficult than they had believed, that the skulls and human bones are at least as interesting and as valuable to preserve intact as the objects of human industry. He declared in unmistakable terms that prehistoric stations, once disturbed, were forever destroyed. He enlarged upon the necessity for anthropological science that the excavations, when done, should be well done; if not, they are lost to us, or our children and our grandchildren, and a great part of our national treasure will be scattered and destroyed.

MM. Cartailhac and de Mortillet came to the aid of Dr. Topinard, and seconded him in his views. It was finally agreed that a commission should be appointed which would be charged with preparing these instructions, and the congress appointed Drs. Topinard, Hamy, Reinach, and Cartailhac to prepare it.

(*To be continued.*)

Preliminary Notes on the Archeology of Southwestern New Mexico.—In connection with the geological work which the writer has been conducting in Southwestern New Mexico, during the past two years, investigations in the archeology of the region have also been pursued, and with gratifying results. This ancient home of the

Aztecs and cliff-dwellers is indeed one of the regions of the most profound interest to the archeologist to be found on the American continent. Almost everywhere on the now bare and desert plains, in the fertile valleys, lovely cañons, and even lofty mountain-tops, the ruined houses and pueblos of this most interesting and once-powerful people, exist.

It is evident that both the Aztecs and cliff-dwellers (were they distinct races?) were driven out by a stronger race, whether by the Spaniards or others. Their houses have been burned, and in every room in the ancient pueblos which the writer has examined there are found from one to several well-preserved skeletons of men, women, and babes, all apparently laying where they fell by the hands of foes.

All inflammable material, as the reeds, grasses, and poles forming the roof and posts, have been consumed, and the rocks and adobe fallen in, burying the bodies of their former inhabitants where they fell. Generally the household utensils, etc., are found where they were apparently last used.

In the Mimbres valley and elsewhere these ancient ruins are very numerous, occurring from one-fourth to two miles apart.

In making excavations in these ruins the writer has found beautiful clay and sandstone dishes, clay (made from fragments of painted pottery), bone, stone, and turquoise beads and ornaments, various stone implements, utensils, etc.

At Cook's Peak extensive mining operations were carried on by these ancient people,[1] and now are to be seen large numbers of their ancient workings, which had been filled with débris worked from the mountain-side, but which have since been cleaned out, and the mines now worked.

These old mines are of great interest, and much time and study have been given them by the writer. The ore is mainly a low-grade argeniferous "sand-carbonate." In mining, fire and water and rude stone hammers were used.

Of these hammers the writer has found more than thirty. When these mines were cleaned out ashes and large quantities of charcoal were found, all presenting as fresh an appearance as if the work had been done but a short time ago. When the hard galena ore was reached the mines were abandoned. There have been found in these mines small voyers, broken pottery, arrow-points, bone, crystal, and turquoise beads, stone hammers, etc., most of which are now in the writer's possession. I also found a small, rude smelter near one of these antique mines, and a quantity of slag close by.

[1] It may yet prove that the mines were worked while these people were *peoned* by the Spaniards.

Near these mines ancient reservoirs for the storage of water are found in the "gulches." The water doubtless was used in mining.

In some sheltered places in the valleys and cañons can still be plainly seen old cornrows and *sakeys* (irrigating ditches).

On the east, west, and middle branches of the Gila River, in the Mogollon Mountains, is to be found as rough, wild, and broken a tract as is to be discovered in any part of the great Rocky Mountain region. Here in the rugged cliffs are found great numbers of ancient cliff-dwellings, some of which are unsurpassed in interest.

Considerable time was devoted to the study of these dwellings, making explorations in, and plans and sketches of, them, as well as drawings of many of the more interesting and extensive hieroglyphics painted on the rocks by the former inhabitants of these dwellings. One of these ancient cliff-dweller's pueblos (if I may so term it), situated in a lofty cliff which forms the side of a deep, narrow cañon that extends out from the west branch of the Gila, is of special interest in many ways. This cliff-dwellers' village is in a fine state of preservation, and consists of upwards of twenty-eight rooms.

Several days were spent in making explorations in these dwellings. Large quantities of valuable relics were found in the débris of the rooms. Among the relics obtained were specimens of several kinds of cloth, all made from the fibre of the Spanish dagger, matting of bear-grass, willow-work, sandals, cords of various sizes, feather-work, a ball and large skein of twine of the same material as the cloth, human and animal bones, stone utensils, great quantities of corn-cobs, corn, squash or pumpkin rinds, seeds, and stems, corn-husks, beans, gourds, pottery, braided human hair of a brown color, etc.; and last, but by no means least, a perfectly preserved cliff-dweller mummy. This was a mummy of a small child, with soft brown hair, similar to that found braided, only finer. It was closely wrapped in a considerable amount of two varieties of coarse cloth, woven from the fiber of the Spanish dagger, then wrapped in a large, nicely woven mat of bear-grass, and tied on by cords of the same material as the cloth to a small, curiously shaped board of cottonwood. The position relative to the relics found, together with much other evidence, demonstrate conclusively that this is a mummy of a true "Cliff-dweller."

So far as I am aware, this is the only specimen of its kind ever discovered; and as to the value of the relic and discovery every archeologist can judge.

In the near future I propose to publish a detailed account of the results of my archeological researches in this strange country.—CLEMENT L. WEBSTER.

MICROSCOPY.[1]

The Nervous System of Convoluta.[2]—The discoverer of the nervous system of the acœlous Turbellaria, Yves Delage, recommends gold chloride as a means of demonstration.

A number of Convoluta are placed in a watch-glass, and most of the sea-water removed. Formic acid (33 per cent.) is then poured over them, killing them almost instantly. At the end of two minutes the formic acid is removed, and gold chloride (one per cent.) put in its place. After ten or twelve minutes' exposure the gold chloride is replaced by formic acid (two per cent.), in which the Convoluta remain, in the dark, until the stain is complete (from one to three days). It is well to allow the planarians to become uniformly violet and opaque, and then to decolor them with cyanide of potassium (one-half per cent.). This reagent is allowed to act, according to the case, from two to twenty-four hours. The decoloring action can be arrested by washing with formic acid (two per cent.). The preparations can be mounted in balsam, but glycerine, with a slight admixture of formic acid, gives the best results. The prolonged action of the formic solution renders the animals supple, so that they are easily arranged on the slide.

The results obtained with gold chloride are notoriously variable. According to Delage's experience, out of three or four trials one at least is sure to be a success. In the same operation the results are different for different individuals. The best-stained specimens are easily recognized with a low magnifying power, and these alone are set aside for mounting.

If sections are required, the worm, after being decolored in formic acid, must be hardened in the usual grades of alcohol. It is important to have the object extended and free as possible from wrinkles and contortions. This end can be best secured by subjecting the worms to slight pressure under a cover-glass while applying the formic acid (33 per cent.). Even then many of them will find space to twist themselves out of shape, but some will remain straight, and these can be selected for cutting.

In order to cut several individuals at once, all oriented alike, Delage passes them through chloroform, with a mixture of chloroform and paraffine. From this he removes them to a slide smeared with oil, and

[1] Edited by C. O. Whitman, Clark University, Worcester, Mass.

[2] Yves Delage. Arch. de Zool. Exp. et Gén, 1886, p. 113.

arranges them with a small brush. The slide is then carefully lowered into a dish of warm paraffine, and usually reaches the bottom without deranging the specimens. After cooling, the slide is taken out with the Convoluta still in place. From six to a dozen may thus be imbedded and cut in a single series.

Osmic Carmine for the Histology of the Nervous System.—The gold chloride method serves only for the coarser anatomical features of the nervous system. The finer structure can be studied to best advantage after treatment with osmic carmine. This new reagent is prepared as follows: Take a strong solution of carmine in ammoniacal water, and evaporate it on a water-bath until the appearance of red clouds on the surface indicates that the excess of ammonia has disappeared. After cooling, add an equal volume of osmic acid (one per cent.), and filter under a bell-jar. A very dark fluid is thus obtained, which has the staining properties of carmine and the fixative properties of osmic acid. At the end of some days this reagent loses its odor and becomes darker. Its fixative properties have disappeared, leaving it a good macerating reagent. It is best, therefore, for preservative purposes to mix the acid and the carmine solution at the time of using, or at least not many days before.

The Convoluta designed for sectioning ought to die extended. They will do this in a concentrated solution of sulphate of iron. As soon as they have been killed by this reagent they should be transferred to the osmic carmine, and left from one-half to twelve or more hours, after which they may be hardened in the usual grades of alcohol

For the examination of the "frontal organ" (olfacto-gustatory organ) in the living animal it was found necessary to resort to some immobilizing agent. Experiments with the various agents in common use showed that chlohydrate of cocaine (ten per cent.) was the best. A drop of a solution in distilled water was placed on a slide and evaporated slowly over a lamp. When the water had disappeared and the slide had cooled a number of Convoluta were placed on the small spot of cocaine by the aid of a pipette, leaving as little water as possible, so that they would be slightly compressed by the cover-glass. A good immersion lens was necessary, and examination had to be made with haste, as only two or three minutes elapsed before the tissue became opaque and began to change.

SCIENTIFIC NEWS.

A living illustration of the truth of the evolution theory has been dredged in 392 fathoms off one of the Galapagos Islands, in the shape of a stalked crinoid, or sea lily, in which are united the characteristics of three distinct fossil genera of the same group of organisms,—Apiocrinus of the Bradford clay deposits, Hyocrinus, and Rhizocrinus This interesting survival of a very old and complex type will shortly be described by Mr. Alexander Agassiz.

Dr. Schliemann, like Robertson "the naturalist of Cumbrae,"—whose life, by the Rev. T. R. R. Stebbing, has just been issued by Messrs. Kegan Paul & Co.,—is another striking illustration of the class of men who become distinguished in science in spite of adverse circumstances in early life and subsequent pressure of business avocations. Mr. Robertson in his youth was a farm laborer, but found opportunities, nevertheless, to cultivate his mind as well as the soil. He passed through a Glasgow medical course, but selected a business career, and retired on a competency thirty years ago. Then he found leisure at last to gratify his tastes for natural history, settled on the island of Cumbrae, and worked at various branches of marine zoology, observing and recording natural phenomena. He is acquainted with many distinguished naturalists, and enjoys an honorable and honored old age.

The ninth annual report of the Geological Survey of the United States, for the years 1887–'88, recently issued, is of unusual general interest, as it contains full accounts of the great earthquakes in Charleston and its vicinity, from persons who witnessed the shocks,—that of Mr. Carl McKinley, editor of the *Charleston News and Courier*, being a most vivid and realistic description,—and from numerous well-equipped scientific observers. The city of Charleston, with the exception of Boston, was the oldest and most English-looking of any in the United States. It is interesting to note, from the report of Dr. C. E. Manigault, that the houses built prior to the revolutionary era on the English system of bricklaying, in which shell lime was used, sustained the successive shocks with the least injury. After 1838 inferior lime and methods of building were adopted, and these erections suffered severely. Not half a dozen houses escaped altogether. Nearly twenty buildings were burnt, and all of these were on fire at once on the first eventful night. The actual number of killed was

seven whites and twenty colored persons; of deaths attributed to cold and exposure, eighty-seven. The number of wounded was never ascertained. Low wooden houses appear to be the best suited and safest habitations in earthquake regions. The shocks were felt as far north as Toronto in Canada, south as the island of Cuba, east as Boston, and nearly a thousand miles off in a southwesterly direction in the upper Mississippi region. The volume is illustrated with views of the ruins of Charleston and Summerville, of the fissures on the banks of the Ashley River near the phosphate works, the craterlets of Summerville, and many plans, maps, and diagrams. In fact, the Charleston earthquake was the best observed and most photographed "shake" on record. The shocks traveled at the rate of three miles per second.—AGNES CRANE.

The summer meeting of the American Geological Society is to be held Monday and Tuesday, August 24th and 25th, in the Columbian University, Washington, D. C., and will doubtless be one of unusual interest. The meeting will be preceded August 19th to 22d by the meeting of the American Association for the Advancement of Science, and will be followed by the International Geological Congress, which meets August 26th, and remains in session one week. The three societies will meet in the same building. The foreign members of the International Geological Congress are to be invited to read papers before the Geological Society, and their papers will be given precedence on the program. A number of excursions will probably be arranged. The local arrangements are in the hands of a committee, Mr. G. K. Gilbert, chairman.